Validation documentation
APIs & excipients, solid

HiperScan GmbH

July 18, 2018

Validation documentation of the chemometrics database of the near-infrared spectrometer *Apo-Ident*.
Report number: **50-1.3-2018-04**
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Introduction

The unequivocal proof of the identity of pharmaceutical raw materials based on a monograph or traditional alternative methods is work-intense, time-intense and economically often no longer makes sense. Near-infrared spectroscopy (NIR) provides a new means here. It enables relatively easy, fast and nonetheless safe identity testing via the preparation and evaluation of spectra.

The analysis system *Apo-Ident* was developed specially for pharmacy use. Pharmacists have the duty to check the identity of all raw materials for extemporaneous products in their pharmacies. This normally takes place based on the monographs for the respective substances in the European Pharmacopoeia. But also NIR spectroscopy is described in the European Pharmacopoeia as an identification method which, as opposed to the methods incorporated in the respective monographs, is approved for testing [1] (quotation translated)

> *with the prerequisite that the same results ("namely the determination of the identity" [2]),* (quotation translated) *are achieved as with the described methods and instruments.*

The *Apo-Ident* analysis system serves to identify raw materials for prescriptions in the defined manner according to *ApBetrO* [Pharmacies Rules and Regulations] §§ 6 and 11 at pharmacies (NIR spectroscopy as an alternative testing method). *Apo-Ident* consists of three components:

- An *NIR spectrometer*, which records the spectra of non-preprocessed raw materials in a measuring glass in diffuse reflection or transflection.
- The *QuickStep* spectroscopy software controls the instrument and records the spectra and user inputs via a pharmacy-specific software plug-in. It also generates the test protocol for documentation of the testing and storage of the printout to be signed in the pharmacy.
- The software module *IdentModule* incorporates *reference databases*. The spectra from the *QuickStep* software are presented to it for evaluation.

NIR spectroscopy is a very powerful analytical method. It is also able to establish the identity of several chemical compounds and mixes in as far as an appropriate database (technically correct: a chemometric model) was created. Identity testing with *Apo-Ident* is a very safe, very fast and easy to operate analytical method for testing a large number of raw materials.

Context of this document

The suitability of the instrument, method and database is proven as follows:

- *NIR spectroscopy as a method for identity testing:* The *Ph. Eur.* [3] describes NIR spectroscopy in *Section 2.2.40* as an analytical method which is also suitable for the identification of raw materials. Therefore, validation of the method as such is not necessary.
- *Performance of the instrument:* The *Ph. Eur.* [3] furthermore describes the apparatus and the testing of its performance in *Section 2.2.40*. The document *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4] compares the implementation by *Apo-Ident* with this monograph in order to prove that *Apo-Ident* meets the specifications of the Pharmacopoeia. Each individual instrument delivered to a pharmacy is qualified in accordance with the tests described in *"Control of Instrument Performance"*. In this test, the unit consisting of analysis instrument hardware and the *QuickStep* spectroscopy software is assessed. The result is documented in a test protocol which is kept at the pharmacy.
- *Validation of the database* is documented separately for each substance class. The report at hand documents the substance class *APIs & excipients, solid*.

The *Arbeitsgemeinschaft der Pharmazieräte Deutschlands (APD)* [Working Group of German Pharmacy Inspectors] has clarified the following in its resolution dated October 16, 2013 ([5], quotation translated):

> *NIR is a testing method incorporated in the Pharmacopoeia. The testing quality depends on the quality of the database stored. The* APD *views the use of NIR instruments in case of ensured validation of the databases used in conjunction with it as one of several options for identity testing.*

The *APD* defined more precisely ([6], quotation translated) on October 1, 2014:

> *The use of near-infrared is a recognised testing method according to* Ph. Eur. 8. *For the use of NIR instruments in pharmacies for testing the identity of raw materials, sufficient and verifiable validation of the instrument used is required. The quality of the database stored by the instrument manufacturer is decisive for quality. Batch-specific differences with the same original substances must be taken into account if present.*

So NIR is basically suitable. The validity of the reference database is proven with the existing validation documentation.

Criteria for the inclusion of substances

This validation documentation describes the results of the validation of the reference database for the substance class *APIs & excipients, solid*. Validation documentation is created for each published version of the reference database for all substance classes incorporated.

The reference database is incorporated in the software module *IdentModule*. During identification testing with *Apo-Ident*, spectra which are used for evaluation purposes are presented to it by the *QuickStep* software. In the same manner, the *IdentModule* is presented all validation spectra successively during the validation runs for evaluation purposes. The *IdentModule* responds respectively (without taking the initial assumption into account) with the identified substance or rejects it as unknown. The correctness of this response is checked for each possible initial assumption and counted.

The results are summarised for each substance and reproduced in this document. The core statement of this validation report is that the following criteria must be fulfilled for each database entry, so that *Apo-Ident* offers verification of identity by means of NIR for the relevant substance/substance group:

- The database is exclusively generated from spectra which have been recorded by *HiperScan GmbH* on traceable samples in pharmaceutical quality.
  - The samples are procured via typical pharmacy sources (*DAC III.2.: Bezugsquellennachweis für Rezepturbestandteile [reference source for prescription components]* [7]).
  - A valid manufacturer's certificate exists (content, purity and identity of the batch).
  - The identity was confirmed by a certified test laboratory or *HiperScan GmbH*.
- Each version of the reference database (every update) is validated in-full.
  - Calibration spectra (*Type A*), other spectra recorded under the control of *HiperScan GmbH* (*Type B*), and spectra from the field (*Type C*) are presented to the *IdentModule* for evaluation in three separately evaluated validation runs.
  - Here, no single *false positive* result may arise.
  - Here, the various substance classes are also tested for reciprocal rejection, where this is objectively justified (see *Summary* section).
- In the validation with spectra recorded under the control of *HiperScan GmbH*, spectra of at least one independent sample must be considered, i.e. spectra from a batch whose spectra have not been used for the generation of the database. In addition, the set of *Type A* and *Type B* spectra must originate from at least three different batches.
- Spectra of additional substances may be used for the generation of the database even though they will not be offered for identification by this database. The purpose is the reliable distinction from these substances.

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- Any positive result of *Apo-Ident* confirms the identity of the substance/substance group and distinguishes it from all other substances of the database. In the case of substance groups, the result is ambiguous: Distinction from all substances not belonging to the group is proven. The substance is identified as a member of this group. However, within the substance group, it is not possible to reliably classify which substance has been tested.

- The criteria for clear identifiability are a specificity of 100 % (true negative rate) and a minimum distance in the distance matrix. See 2. d) under Model creation procedure and validation runs.

Validation concept

Chemometrics is a statistical technique for the extraction of relevant chemical information from spectra. In mathematics, this method is described as *multivariate data analysis*. Chemometrics proceeds here as follows:

1. Collection of spectra for the *calibration sample*. The results (identities) of the calibration sample must be known. The calibration samples must be representative for the samples which are to be evaluated later. Therefore, they must take the various possible (physical) compositions into account. (Therefore, sourcing calibration samples for NIR from the specialist trade is superior to the use of CRS reference substances.)

2. The first mathematical step is *calibration*. Here, the chemometric model is calculated from the *calibration sample spectra* (reference spectra) and limits as well as some parameters are stipulated. The chemometric model is used later to calculate the analysis result (*prediction*).

3. Collection of further spectra for the *validation sample* which should be independent of the *calibration sample*. The results (identities) of the *validation sample* must also be known. The textbook suggests a random sample with a normal scope of 25 % to 50 % of the *calibration sample* [8].

4. The second technical data step is *validation*. Here, the chemometric model created is evaluated based on the spectra of the *validation samples*. As validation parameters for the identification, the *Ph. Eur. Section 2.2.40* [3] specifies the specificity and robustness.

The validation step according to the textbook has the target of estimating the performance capability of the model created based on a random sample. In order to achieve the best possible precision, attention is paid to the calibration sample. In the field of pharmaceuticals, the safety of the method has priority. In order to be able to *validate* the model within the regulatory scope, the validation step must include probative force. For this purpose, the validation sample must be *representative and complete* in order to enable the testing of all cases.

A *sufficient number of batches* must be secured for validation because validation finally proves whether the number of batches in calibration suffices.

Each substance is validated individually. The validation results are documented per substance in this document. Moreover, the documents show how many and which batches have been used for creating the model or model validation.

At least one certificate is taken in for each substance from an accredited test laboratory for the independent testing of identity of the sample. The identification number of the corresponding test certificate is listed in the report, enabling traceability of a substance tested according to the monographs in the Pharmacopoeia.

Model creation procedure and validation runs

The safety of the chemometric models is guaranteed by several measures during model creation, of which the validation step is the final one. Normally, the procedure is as follows. It is in particular valid for the active pharmaceutical ingredients (APIs) *solid API excipients*, *liquid/semi-solid API excipients (with a test certificate)*, *narcotics - solid medicinal substances* and *drugs*. If, for individual substance classes, variations are required, they are depicted in the section *Particularities of individual substance classes*.

1. Collecting the reference spectra (calibration sample)

a) Procurement of the samples from the same sources from which pharmacies source their raw material for compounding (Caelo, Fagron, Euro-OTC, ..., see also *DAC III.2. Bezugsquellennachweis für Rezepturbestandteile* [Sources of supply for compounding] [7]).

b) Testing the suitability according to *ApBetrO* [Pharmacies Rules and Regulations] §§ 6, 11, that is to say the availability of a valid manufacturer certificates via identity, purity and contents of the batch.

c) Recording standard 40 spectra of the sample in different positions, as a standard on four instruments. Here, handling and presentation of the samples as later in the pharmacy.

d) Visual checking for anomalies in the spectra. In case of indications of measurement errors, measurement must be repeated. If a signature is missing in the spectrum, the substance may be excluded from the start as not promising (the spectra are nonetheless entered in the database validation as independent *Type B* spectra).

e) Testing identity. For each substance, a certificate of correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the respective following substance page of this validation documentation the *Mahalanobis distance* to this reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance. Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

   HiperScan GmbH cooperates with some suppliers as follows: the raw materials supplier takes a sufficiently large sample in his incoming goods area so that part of it can be used for recording the NIR spectra. The remainder of the sample goes to analytics for market approval. The manufacturer's batch certificate emerges from these identity, contents and purity tests, which consequently also prove the correct identity of the NIR reference sample. Therefore, the NIR spectra are suitable for structuring the database *(Type A)* and can also optionally be used for validation *(Type B)*. The samples which this applies to are marked in the validation report with a footnote.

f) If the identity of the new sample is proven, it is declared as a reference sample and the spectra are approved for structuring the database.

2. Generating the chemometric models (calibration)

a) Determination of the transformation matrix from the reference spectra using variance maximisation [8, 9]. (*All* reference spectra are always included, even if only a few spectra are added for an update.) All reference spectra receive the same data pre-treatment, which is also later applied to all measurement spectra in the field (in the pharmacies).

b) Checking that the number of principal components used is still sufficient.

c) Calculating the limits for each substance from the spread of the reference spectra. The calculation regulation is identical for each substance in a substance class.

d) Checking the distances between the limits of the separable substances: the distance matrix incorporates the *Mahalanobis distances* from each substance to all the others. If a distance is less than 10, both two substances must be declared as inseparable or *both two* must be removed from the database. (The spectra of removed substances remain as independent *Type B* spectra in the validation.)

e) Testing the model based on the reference spectra. If *false positive* results arise, you must proceed as in the case of *Mahalanobis distances* which are too small.

f) If chemometric models are available for all substance classes which meet both criteria (distance matrix and no *false positives*), they are joined together with the evaluation algorithms as an *IdentModule* and encrypted. This unit can no longer be changed. Its overall function is tested by validation.

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3. Set of validation spectra (validation samples)

The following is provided for validation:

a) *Type A*: The reference spectra = calibration spectra from which the database was generated. These also include spectra from substances which the *chemometric model* should not identify, but were also recorded during generation in order to increase selectivity. (As a result, the model "learns" to differentiate from other substances which are actually unknown to it.)

b) *Type B*: Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database. These also include reference spectra of other substance classes, and spectra that are not used as reference spectra. Samples are considered to be independent, if they originate from a batch, of which no spectra have been used for the generation of the database. (Up to *IdentModule 2018-01*, samples were still considered independent if the sampling was done independently, i.e. if they originate from another sales container.)

c) *Type C*: Spectra from the field, which have not been recorded under the control of *HiperScan GmbH* and have not been used for the generation of the database. The spectra include not only substances of the substance class to be tested, but also substances from other classes.

All manufacturers' batches from which spectra are used for the validation are listed by substance in this document: for substances included in the substance class *APIs & excipients, solid* in the respective validation reports; otherwise in attachments *A*, *B* and *C*.

Furthermore remains valid: validation spectra may only be removed if a error in the spectrum can be proven. Here, the spectra are not deleted, but instead placed on a *blacklist* incorporating the reason, date and initials in the commentary.

The section *Particularities of individual substance classes* treats the other substance classes from which *Type B* and *Type C* spectra are cited for validation purposes.

4. Validation runs and approval

a) Validation spectra are transferred holistically to the *IdentModule* for evaluation in the same way as the spectroscopy software *QuickStep* transfers measured spectra.

b) Following the provision of each spectrum, the *IdentModule* responds as to whether it has recognised a substance and which substance was recognised.

c) The correctness of this response is checked for each possible initial assumption (each measurable substance with the substance class) and counted according to *true negative*, *false negative*, *true positive* and *false positive*. These figures are provided for each substance and additionally in the section *Summary*, separated according to types *A*, *B* and *C* .

d) No *false positive* results whatsoever are permissible.

e) If the criterion is also met for all substance classes, the *IdentModule* is approved.

Particularities of individual substance classes

Basically, *HiperScan GmbH* procures and tests the manufacturer's certificate for the batch, commissions external testing of the identity of the sample or carries it out independently and stores the certificates. As described, this process is established for the Pharmacopoeia substances, that is to say for substance classes **APIs & excipients, solid**, **APIs & excipients, liquid/semi-solid (with analysis certificate)**, **Narcotic substances, liquid/semi-solid** and **Drugs**. Therefore, *HiperScan GmbH* is able to furnish proof of the identity of the reference samples. In case of manufacturer-specific substance classes and others, individual steps are organised differently in-part:

The substance class **APIs & excipients, liquid/semi-solid (other)** (often described as cosmetics) incorporates substances for which no specification of the requirements of the pharmaceutical quality is determined, neither in a Pharmacopoeia monograph, a DAC/NRF monograph nor via a manufacturer's specification. Consequently, neither the identity nor contents can be tested independently. No certificates whatsoever exist for the reference samples. So here, merely the matching of the sample with former samples of this product is established and confusion with the other substances

is ruled-out. (If the manufacturer of such a substance prepares a specification, determines testing methods and provides manufacturer's certificates in accordance with *ApBetrO* [Pharmacies Rules and Regulations] §§ 6, 11, *HiperScan GmbH* can assign the substance to the substance class *APIs & excipients, liquid/semi-solid (with analysis certificate)* again in the future).

Substance class **HCK – nutritional supplements (Hepart)** contains the HCK micro-nutrients from the Swiss company *Hepart AG*. *HiperScan GmbH* receives the reference samples directly from the manufacturer. For each reference sample, *HiperScan GmbH* also receives manufacturer's certificates and keeps these. New checking of the identity of the reference sample is not carried out by *HiperScan GmbH*. The identity of the reference samples is therefore documented by *Hepart AG*. The spectra of all batches provided by *Hepart AG* are recorded by *HiperScan GmbH* and entered in the database.

All the manufacturer's batches are used for the generation and validation of the substance class *HCK*. The expected variation is also represented in the generation and validation if there are less than three batches.

Also, for the substance class **PhytoComm** (TCM-Granulated herbal extracts of the manufacturer *PhytoComm*) spectra for all useable batches are recorded by *HiperScan GmbH* and entered in the database. The supplier organises the respective tests themself and keeps the test certificates.

A new evaluation option was created for the class *PhytoComm* with the update 2016-01. As the risks are considerably fewer than those from chemical agents, the pharmacist can specify a reasonable criterion for the *specificity* in accordance with internal risk estimation. The database for this is created without taking safety distances into account and no criterion is determined in advance for the *specificity*. Instead, the *specificity* for testing the identity with this concrete substance is calculated in the validation for each substance and provided with the measurement result. The pharmacist then judges himself whether this safety is reasonable with regard to the risk of the substance.

Additionally, a statistical forecast is provided for the *specificity* which is determined according to the *Rule of Three* [10, 11]. For this forecast, it is assumed that there would have been three wrong results more and is provided with a lower limit for *specificity*. This value has a special meaning if a *specificity* of 100 % is achieved for a substance during validation. In this case, the lower limit allows conclusions regarding the scale of existing safety for which with an endless number of validation spectra a value of less than 100 % is to be assumed.

If, for example 14 000 spectra not belonging to the substance are presented and no *false positive* classification is made, a hypothetical number of three *false positive* results is assumed (*Rule of Three* [10, 11]) and the *specificity* is defined with 100.0000 % (> 99.9786 %). Here, it applies that the higher the number of validation spectra which form the statistical basis, the better the *specificity* calculated via the lower *specificity* limit will be approximated.

The positive result of the identity test using *Apo-Ident* establishes that the sample spectrum is in accordance with a batch of the specified granulate from the supplier *PhytoComm*, whereby all useable batches from the supplier are known.

The *PhytoComm* class can only confirm the identity of batches that have been used for the generation of the database. As a consequence there cannot be any validation spectra of other batches. Therefore, the criterion reads that two samples (from different sales containers) from each batch must exist, one for the structure of the database (*Type A*) and one for the validation (*Type B*).

Significance of testing with *Apo-Ident*

The analysis result is determined using sophisticated statistical methods according to state-of-the-art science and technology. Chemical and pharmaceutical knowledge is applied for the selection of the samples from which the calibration spectra and validation spectra are recorded. Otherwise it does not influence the further steps of model creation.

Verbally, the statement of the analysis result can be expressed as follows. Here *"the spectra match"* means that the criteria *Mahalanobis distance*, *outlier analysis* and *correlation* are met as shown in *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]. "The spectra do not match", on the other hand, means that at least the criterion *Mahalanobis distance* is not met.

The positive analysis result *"was identified as ..."* is very meaningful because both the quantity of substances to be taken into account and the number of underlying samples is very comprehensive.

1. The spectrum of the sample measured matches spectra of the defined substance.

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2. The spectrum of the sample measured does not match any spectrum of any other substance in this substance class. Therefore, all other substances can be clearly ruled-out.

3. As the spectra from other substance classes were used for validation, it is proven that no spectrum of one of these other substances matches the defined substance. (All substance classes with which a spectrum comparison is possible and makes sense are used for validation. This is documented for each substance class in the section *Summary*.)

4. If the defined substance belongs to a *substance group* which in itself is not clearly separable with *Apo-Ident*, matching with the spectra of one or several substances in this group is confirmed. Which of these substances it actually is cannot be determined clearly. All other substances are excluded analogous to 2 and 3.

On the other hand, a negative analysis result *"was not identified as ..."* means:

1. The substance offered could not be recognised based on the spectrum of this sample.

2. The identity of this sample is not confirmed.

3. Testing must be repeated in accordance with the specifications of the Pharmacopoeia.

Conclusion

NIR spectroscopy is a testing method incorporated in the Pharmacopoeia. In case of successful database validation, it is a possible method for identity testing [5]. *Apo-Ident* meets the criteria of the *European Pharmacopeia* as a near-infrared spectrometer and proves the validity of the reference database with the existing validation documentation. This means that *Apo-Ident* can be used as an alternative testing method for testing raw materials at pharmacies.

Explanation of terminology

The following section serves to explain or define specialist terminology which is required in order to understand this document. If necessary, definitions for the analysis system *Apo-Ident* are defined more precisely.

The term database is used in this document exactly as in the *Ph. Eur. Section 2.2.40* [3] synonymous with chemometric model. In order to differentiate the databases which are relatively independent of each other, *HiperScan GmbH* frequently also uses the term substance class (primarily in the plural). On the other hand, the spectra used to structure the database are termed spectrum collection and not database.

Substance classes are units of the organisational structure of the *IdentModule*. The substance classes are substance databases which are also broadly independently subscribable. On the one hand, the liquid and semi-solid substances are separated from the solid powders because they are measured against different references and therefore the spectra cannot be compared. On the other hand, for example the Pharmacopoeia substances are kept separated from the manufacturer-specific database *PhytoComm* for TCM (traditional Chinese medicine) raw materials.

The individual substance classes need only be limited against each other in-part. Often, no risk of confusion exists because they can only be procured from different sources. On the other hand, in several cases we handle substances which need not be distinguished. For example, em Huang Qi granulate from the company *PhytoComm* neither needs to be delimited from *Huang Qi* granulate from the company *HerbaSinica* nor is matching required. Respectively one single chemometric model is behind a substance class. (Even if several reciprocally secured chemometric models would be permissible.) The terms *substance class*, *chemometric model* and *databases* are mostly used here as synonyms.

A substance group respectively summarises all the substances within a substance class which cannot safely be distinguished from one another based on their NIR spectra. However, all the other substances in the database can be excluded.

The formation of subgroups is mentioned in the *Ph. Eur. Section 2.2.40* [3]. In this manner, technical restrictions in case of extensive databases can be avoided and it is possible to prepare individual subgroups with different spectrum pre-treatment. Validation of the subgroups against each other is required. *HiperScan GmbH* has solved these technical restrictions and doesn't use any subgroups within a substance class any longer.

Principal component analysis (PCA) [8, 9] is a multivariate statistics process or multivariate data analysis. It serves to structure, simplify and illustrate comprehensive data records by describing a large number of statistical variables by describing a lower number of linear combinations (the *principal components*) which are as significant as possible. In the *Apo-Ident IdentModule*, *PCA* is used to evaluate the recorded spectrum data (corresponding with *Ph. Eur. 2.2.40* [3]).

The term validation is defined in both relevant contexts here with different (even if related) meanings.

Within the sense of the expert discipline of *chemometrics*, validation is a process step when creating a chemometric model: after a transformation matrix, limits and various parameters have been calculated or determined from a set of reference spectra during the course of the calibration step [8, 9], the validation step determines the performance capability of the model (selectivity, precision, ...) based on the validation spectra. Normally, random sampling is planned here. In order for the validation to gain strength of proof, the validation spectrum set must be selected with an appropriately wide scope (*representative* and *complete*). The terms *validation run* and *validation step* always actually mean the process step in this sense.

In the regulatory sense (of pharmaceutical production), validation is the documented proof that a process or system meets the previously specified requirements reproducibly when applied practi-

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cally. In this sense, the *Apo-Ident* databases only become validated databases with the validation documentation, which this document is part of.

The *European Pharmacopeia* uses the term validation in *Section 2.2.40* within the sense of the specialist discipline of *chemometrics* [3].

The robustness of a process is the property of only being influenced by environmental fluctuations (e.g. temperature or humidity) a little. A method is robust if the environmental conditions do not or hardly falsify the final result.

The specificity of a classification (of a chemometric model) is the true negative rate.

The recognition rate (also sensitivity) is the true positive rate. It defines in how many percent of cases a correctly set up substance is actually confirmed.

The true negative rate describes the share of spectra correctly classified as non-identity during validation. This is equivalent to correct classification. It means that a substance A within identity checking as substance B is judged as *"not identified"*. The *true negative rate* is equivalent to the conditional frequency

$$h(\text{rejected}|\text{genuinely no identity}) = \frac{r_n}{r_n + f_p}$$

with r_n as the total number of *true negative* classifications and f_p as the total number of *false positive* classifications. For successful validation of an *IdentModule*, all spectra presented belonging to this category must be classified as *not in accordance*.

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of this number. The weight of each spectrum of a substance/substance group i therefore results as

$$w_i = \frac{1}{n_i}$$

with n_i number of spectra in this substance/substance group. This weighting ensures that the overall result cannot be enhanced by adding especially large numbers of spectra from easily separable substances.

The true positive rate describes the share of spectra correctly classified as identity during validation. This is equivalent to correct classification. It means that a substance A within identity checking as substance A is judged as *"identified"*. The *true positive rate* is equivalent to the conditional frequency

$$h(\text{identified}|\text{genuine identity}) = \frac{r_p}{r_p + f_n}$$

with r_p as the total number of *true positive* classifications and f_n as the total number of *false negative* classifications. The *true positive* rate is a measure for the recognition rate of the validated *Apo-Ident IdentModule*.
In order to ensure that each substance is received with the same weight, the spectra are weighted as described for the true negative rate.

The true negative result describes a spectrum correctly classified as non-identity during validation. It is equivalent to correct classification. It means that a substance A within identity checking as substance B is judged as *"not identified"*.

The false positive result describes a spectrum falsely classified as non-identity during validation. This is the most critical type of possible false classification. It means that a substance A within identity checking as substance B is judged as *"identified"*. For successful validation of an *IdentModule*, a number of false positive events of zero are demanded for all spectra entering the validation. The exception to this restriction is the class of TCM granulates from the company *PhytoComm* as described under *Particularities of individual substance classes*.

The true positive result describes a spectrum correctly classified as identity during validation. It is equivalent to correct classification. It means that a substance A within identity checking as substance A is judged as *"identified"*.

The false negative result describes a spectrum falsely classified as non-identity during validation. It is equivalent to false classification. It means that a substance A within identity checking as substance A is judged as *"not identified"*.

The 'Rule of Three' says that with a probability of 95 % the next random sample of the same size no more than three false results are to be expected if no false result existed in the existing random sample [10, 11].

The *specificity* and *recognition rate* are determined both globally and from the validation runs for all substances. The information is supplemented with the hypothetical value if there had been three false results more. The percent information is provided in parentheses with the "greater than" symbol '>', e.g. *specificity* 100.000 % (>99.983 %) if 17 567 false spectra have been presented without one single *false positive* result. The larger the statistical basis, the lower the influence of the hypothetical false results.

The Mahalanobis distance is a distance measure between two points in n-dimensional vector space. Here, the respective direction component of the distance to *standard deviation* [12] of an n-dimensional distribution is standardised. In case of the *principal component analysis* [8, 9] this standardisation relates to the distribution of the respective calibration data set for a classification (substance/substance group) in the *principal component space* [8]. The *Mahalanobis distance* of a point (mapping of a spectrum) $\vec{y}$ in the n-dimensional principal component space to the expected value of an n-dimensional distribution $\mathbf{X}$ then results as

$$d(\mathbf{X}, \vec{y}) = \sqrt{(\bar{\mathbf{X}} - \vec{y})^T \mathbf{S}^{-1} (\bar{\mathbf{X}} - \vec{y})} \qquad \text{with} \qquad \mathbf{X} \in \mathbb{R}^{m \times n}, \vec{y} \in \mathbb{R}^m$$

[13]. Here, m is equivalent to the number of principal components used (dimension of the principal component space) and n the number of measurements existing in the calibration data set (spectra). $\bar{\mathbf{X}}$ is the expected value of the resulting distribution for the calibration data set (the average value of n measurements received). $\mathbf{S}^{-1}$ is the inverse covariance matrix [12] for distribution $\mathbf{X}$.

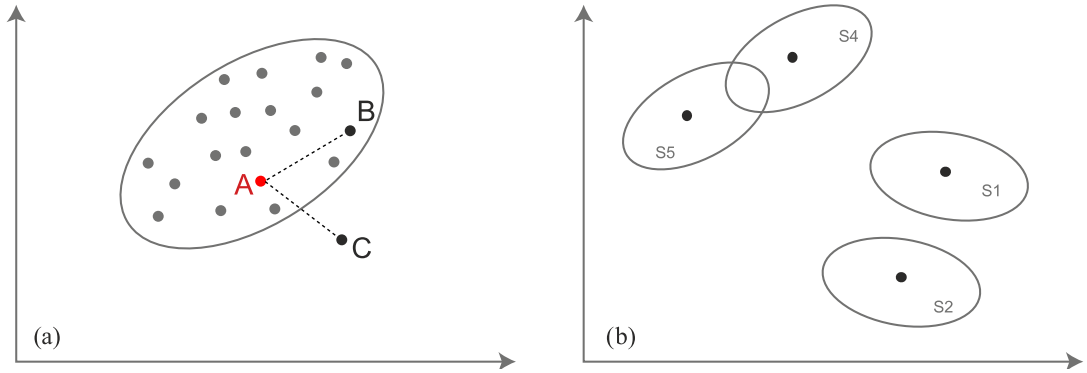


Figure 1: (a) The *Mahalanobis distance* from A to B is less than from A to C. However, the Euclidean distances are identical. (b) The *Mahalanobis distance* between the two measurement series *S4* and *S5* is smaller than between *S1* and *S2*. However, the Euclidean distances are identical.

The *Mahalanobis distance* offers advantages compared to the *Euclidean distance*: For the calculation of the distance it takes the statistical properties of a data point distribution (measurement series), i.e. average value, variance and covariance of the data points [14] into account. The *Mahalanobis distance* is applied while creating the reference database for evaluating the spectra from different samples of a substance.

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A chemometric model is a classifier based on statistical methods [8, 9]. Through the respective algorithm used (e.g. *Principal Component Analysis*, *Cluster Analysis*), a maximum of chemical information is extracted from measurement data. Here, systematical or physical disturbances are eliminated using appropriate data pre-processing [15, 16].

At several places in this document, in order to simplify understanding, the term database is used instead of *chemometric model* – in the same manner as in the *Ph. Eur. Section 2.2.40* [3].

A sample (with its own sample ID) refers to substance in a sales container. Repeated sampling from the same sales container is listed under the same sample ID. (The suffix "SI" is not part of the sample ID.) Several samples may originate from the same batch. Samples are called "independent", if they originate from a batch, of which no spectra have been used for the generation of the database. (Up to *IdentModule 2018-01*, samples from different sales packages were considered to be independent.) The information above the list of validation spectra now includes also the number of batches that deliver independent samples for the validation (for both *Type B* and *Type C*).

In case a supplier takes a sample for testing from its incoming goods and splits it to multiple laboratory containers, the substance in all laboratory containers will still be ascribed to the same sample. *HiperScan GmbH* only uses one of the subsamples.

Reference samples are used to structure the database. The *reference spectra* originate from these samples. In chemometric technical jargon you would normally say: For *calibration*, a *chemometric model* is generated from the *calibration spectra* recorded from the *calibration samples*, whose quality is subsequently assessed in validation.

Reference samples are procured via typical pharmacy sources. Their identity is tested. The *reference spectra* are recorded by *HiperScan GmbH*. The documentation also includes the manufacturer's name and batch number.

Reference samples are clearly identified by a sample ID. Samples without sample ID may not be used as *reference samples*.

Summary

A total of 311 665 spectra from 29 227 different batches for a total of 866 substances were used to validate the substance class *APIs & excipients, solid*.

Validation samples

The validation samples can be categorised as follows:

Type A Calibration spectra. These are the spectra used to generate the chemometric model. They were recorded by *HiperScan GmbH*. Detailed information regarding the batches or samples can be found in the following validation reports under *calibration samples* and under *Type A*. Further information is listed in *Appendix A*.

Substance class	Substances	Batches	Spectra
APIs & excipients, solid	341	1494	66 444
Specific classifier 26188	9	15	639
Narcotic substances, solid	16	73	5350

From category *A* a total of 72 433 spectra from 1582 batches for a total of 366 substances were taken into account for validation.

Type B Spectra from independent samples which are not included in database generation. These spectra were recorded by *HiperScan GmbH*. Detailed information regarding the batches or samples can be found in the following validation reports in the section *Type B* or in *Appendix B*.

Substance class	Substances	Batches	Spectra
APIs & excipients, solid	496	2382	105 535
Narcotic substances, solid	17	115	5370
Specific classifier 26188	9	18	750
Drugs	342	1050	50 418

From category *B* a total of 162 073 spectra from 3565 batches for a total of 864 substances were taken into account for validation.

Type C Spectra from independent samples which are not included in database generation. *ApoIdent* customers carried out the measurements. Detailed information regarding the batches or samples can be found in the following validation reports in the section *Type C* or in *Appendix C*.

Substance class	Substances	Batches	Spectra
APIs & excipients, solid	393	18 859	58 757
Specific classifier 26188	5	33	39
Narcotic substances, solid	13	313	551
Drugs	290	6948	17 812

From category *C* a total of 77 159 spectra from 26 153 batches for a total of 701 substances were taken into account for validation.

Validation results

The validation runs checked whether all substances/substance groups in the substance class *APIs & excipients, solid* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, the matching of all relevant spectra of various substances with the substances/substance groups in the substance class *APIs & excipients, solid* was checked and the correctness of the results was evaluated. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	66 099	305	23 112 156
Type B	0	86 220	5659	51 771 009
Type C	0	52 828	2945	24 635 070

All substances/substance groups in the substance class *APIs & excipients, solid* can be clearly distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.000 00 % (> 99.999 96 %)	99.614 82 % (> 99.608 92 %)
Type B	100.000 00 % (> 99.999 98 %)	92.893 34 % (> 92.888 43 %)
Type C	100.000 00 % (> 99.999 64 %)	91.479 42 % (> 91.382 02 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Acetylcysteine**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20040-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Acetylcysteine; Acetylcysteinum

Special notes

When selecting the *Acetylcysteine* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Acetylcysteine*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Acetylcysteine	12299020	21315	40	20121026
Euro OTC	Acetylcysteine	1208026-01	21628	40	20121116
Euro OTC	Acetylcysteine	1510016	22228	40	20151116*
Caelo	Acetylcysteine	161398	22469	40	20160520*
Euro OTC	Acetylcysteine	1610011	22854	40	20161107*
Fagron	Acetylcysteine	15C16-B06-308039	22886	40	20150402

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 240 spectra of 6 reference samples from the substance/substance group *Acetylcysteine*. These samples are listed above in the section *calibration samples*. The reference samples originate from 6 different batches.

- 72 193 spectra from a total of 1576 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 210 spectra from 7 reference samples of the substance/substance group *Acetylcysteine*.

- These include spectra of independent samples from 4 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Acetylcysteine	08G23-N06	20040	30
Caelo	Acetylcysteine	08309805	20176	40
Euro OTC	Acetylcysteine	1208026-01	21628†	20
Euro OTC	Acetylcysteine	1510016	22228†	20
Caelo	Acetylcysteine	161398	22469†	20
Caelo	Acetylcysteine	163340	23035	40
Euro OTC	Acetylcysteine	1801037	23956	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 863 spectra from a total of 3492 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 21 spectra from 16 *Apo-Ident* customers from 18 batches from the substance/substance group *Acetylcysteine*.

- These include spectra of independent samples from 17 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Phönix	Acetylcysteine	1208026	1
Phoenix goettin	Acetylcysteine	1208026-01	1
Euro OTC	Acetylcysteine	120802601	2
Caelo	Acetylcysteine	130702601	1
Euro OTC	Acetylcysteine	12299010	1
Caelo	Acetylcysteine	12299021	1
Caelo	Acetylcysteine	12299027	1
Euro OTC	Acetylcysteine	1307026-02	1
Euro OTC	Acetylcysteine	1408004	1
Euro OTC	Acetylcysteine	1505011-01	1
Caelo	Acetylcysteine	15114007	1
Sanacorp 07.03.2016 10,...	Acetylcysteine	15114007	1
Caelo	Acetylcysteine	15114013	2
Caelo	Acetylcysteine	16139802	1
Caelo	Acetylcysteine	10230708	1
Caelo	Acetylcysteine	10230713	1
Caelo	Acetylcysteine	12299004	1
Fagron	Acetylcysteine	13A22N07	1
Caelo	Acetylcysteine	12299002	1

- 77 138 spectra from 463 *Apo-Ident* customers from a total of 25 529 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Acetylcysteine* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Acetylcysteine* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	240	0	72 193
Type B	0	194	16	161 863
Type C	0	20	1	77 138

The substance/substance group *Acetylcysteine* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.5000 %)
Type B	100.0000 % (> 99.9928 %)	92.3810 % (> 90.9524 %)
Type C	100.0000 % (> 99.8850 %)	95.2381 % (> 80.9524 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21315	22469	8.43	90.02
21628	22469	4.64	89.90
22228	22228	0.00	88.43
22469	22469	0.00	88.56
22854	22854	0.00	88.80
22886	22469	7.75	89.45

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Acetylsalicylic acid**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20449-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Acetylsalicylic acid; Acidum acetylosalicylicum; Acidum acetylsalicylicum

Special notes

When selecting the *Acetylsalicylic acid* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Acetylsalicylic acid*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Acetylsalicylic …	13297509	21383	40	20131014
Euro OTC	Acetylsalicylic …	1307024-01	21597	40	20130904
Euro OTC	Acetylsalicylic …	1407026-01	21637	40	20140801
Euro OTC	Acetylsalicylic …	1601042	22377	40	20160204*
Euro OTC	Acetylsalicylic …	1608037	22820	40	20160921*
Caelo	Acetylsalicylic …	161316	23064	40	20160825*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 240 spectra of 6 reference samples from the substance/substance group *Acetylsalicylic acid*. These samples are listed above in the section *calibration samples*. The reference samples originate from 6 different batches.

- 72 193 spectra from a total of 1576 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 320 spectra from 9 reference samples of the substance/substance group *Acetylsalicylic acid*.

- These include spectra of independent samples from 6 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Acetylsalicylic acid	1011015-01	20449	40
Fagron	Acetylsalicylic acid	12D02-N01	20484	40
Caelo	Acetylsalicylic acid	11257102	20508	40
Caelo	Acetylsalicylic acid	11257102	20578	40
Euro OTC	Acetylsalicylic acid	1307024-01	21597†	20
Euro OTC	Acetylsalicylic acid	1407026-01	21637†	20
Fagron	Acetylsalicylic acid	14E02-B04-297099	22949	40
Euro OTC	Acetylsalicylic acid	1703010	23388	40
Caelo	Acetylsalicylic acid	173098	23806	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 753 spectra from a total of 3491 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 114 spectra from 67 *Apo-Ident* customers from 55 batches from the substance/substance group *Acetylsalicylic acid*.

- These include spectra of independent samples from 54 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Acetylsalicylic acid	12212223	4
Euro OTC	Acetylsalicylic acid	815A-01012	1
Euro OTC	Acetylsalicylic acid	1307024-01	9
EuRho	Acetylsalicylic acid	1307024-01	2
Caelo	Acetylsalicylic acid	13297511	1
Phönix	Acetylsalicylic acid	13324114	1
Caelo	Acetylsalicylic acid	13324109	2
Caelo	Acetylsalicylic acid	13324105	1
Caelo	Acetylsalicylic acid	13324116	1
Euro OTC	Acetylsalicylic acid	1407025	1
Euro OTC	Acetylsalicylic acid	1407025-01	14
Caelo	Acetylsalicylic acid	14250101	1
Caelo	Acetylsalicylic acid	14189603	1
Fagron	Acetylsalicylic acid	14B10-B02-296841	1
Euro OTC	Acetylsalicylic acid	1501046-01	3
sanacorp	Acetylsalicylic acid	14250101	1
Caelo	Acetylsalicylic acid	15081301	3
Caelo	Acetylsalicylic acid	15081308	2
EuRo Gehe	Acetylsalicylic acid	147026-01	1
Caelo	Acetylsalicylic acid	15081304	1
Caelo	Acetylsalicylic acid	15334902	2
Caelo	Acetylsalicylic acid	15122701	1
Caelo	Acetylsalicylic acid	15081310	1
Caelo	Acetylsalicylic acid	15334907	4
Caesar & Loretz GmbH	Acetylsalicylic acid	15334914	1
Caelo	Acetylsalicylic acid	15334914	3
Caelo	Acetylsalicylic acid	15334917	3
Caesar & Loretz GmbH	Acetylsalicylic acid	15334917	1
Caelo	Acetylsalicylic acid	15334910	1
Caelo	Acetylsalicylic acid	16131607	2
Caelo	Acetylsalicylic acid	17023102	1
Caelo	Acetylsalicylic acid	17023107	2
Caelo	Acetylsalicylic acid	17023108	2
Caelo	Acetylsalicylic acid	17023111	1
Caelo	Acetylsalicylic acid	17329204	1
ACM	Acetylsalicylic acid	KNC2152J13	1
Noweda	Acetylsalicylic acid	10040403	1
ACM	Acetylsalicylic acid	KNC2077J14	1
Caelo	Acetylsalicylic acid	10099907	1
Gehe	Acetylsalicylic acid	10365302	1

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Supplier	Substance	Batch	Spectra
Euro OTC	Acetylsalicylic acid	1107007-01	3
Caelo	Acetylsalicylic acid	11257126	1
Caelo	Acetylsalicylic acid	11239703	1
Caelo	Acetylsalicylic acid	1212005-01	1
Euro OTC	Acetylsalicylic acid	1212005-01	3
Bombastus	Acetylsalicylic acid	1212005-01	1
Phönix	Acetylsalicylic acid	12145402	1
Caelo	Acetylsalicylic acid	12212219	1
Caelo	Acetylsalicylic acid	12212203	1
Caelo	Acetylsalicylic acid	12212230	1
Caelo	Acetylsalicylic acid	12212233	1
Caelo	Acetylsalicylic acid	12212236	3
Fagron	Acetylsalicylic acid	12212234	2
Sanacorp	Acetylsalicylic acid	1307024-01	1
Caelo	Acetylsalicylic acid	13324101	1
Phoenix	Acetylsalicylic acid	13324107	1
Caelo	Acetylsalicylic acid	13324118	2
Caelo	Acetylsalicylic acid	13324119	1
Sanacorp	Acetylsalicylic acid	13324109	1
Euro OTC	Acetylsalicylic acid	20030611-1	1
Noweda	Acetylsalicylic acid	3946120	1
Caelo	Acetylsalicylic acid	3512N-01012	1
Euro OTC	Acetylsalicylic acid	1011015-01	1
Noweda	Acetylsalicylic acid	1107007-01	1

- 77 045 spectra from 463 *Apo-Ident* customers from a total of 25 493 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Acetylsalicylic acid* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Acetylsalicylic acid* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	240	0	72 193
Type B	0	320	0	161 753
Type C	0	111	3	77 045

The substance/substance group *Acetylsalicylic acid* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.5000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 98.1250 %)
Type C	100.0000 % (> 99.8850 %)	97.3684 % (> 94.7368 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several

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new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21383	22377	4.69	54.75
21597	23064	7.69	56.63
21637	22820	10.93	53.47
22377	22377	0.00	53.50
22820	22820	0.00	50.84
23064	23064	0.00	57.95

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Aciclovir**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	21677-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Aciclovir; Aciclovirum

Special notes

When selecting the *Aciclovir* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Aciclovir*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Aciclovir	13B04-B40-294559	21677	40	AR-15-FG-002570-01
Fagron	Aciclovir	13B04-B40-302333	21761	40	20131217
Fagron	Aciclovir	14G07-B05-296462	21831	40	20140728

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Aciclovir*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 153 spectra from 6 reference samples of the substance/substance group *Aciclovir*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Aciclovir	13B04-B40-294559	21677†	20
Fagron	Aciclovir	13B04-B40-302333	21761†	20
Fagron	Aciclovir	14G07-B05-296462	21831†	20
Fagron	Aciclovir	15A15-B10-323362	22938	40
Fagron	Aciclovir	15A15-B10-323362	22939	40
Fagron	Aciclovir	15A15-B10-315379	not required	13

- 161 920 spectra from a total of 3494 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 3 spectra from 3 *Apo-Ident* customers from 3 batches from the substance/substance group *Aciclovir*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Aciclovir	14g07-b05-296462	1
Fagron	Aciclovir	16K09-B05-328196	1
Fagron	Aciclovir	15AS15-B10-307743	1

- 77 156 spectra from 463 *Apo-Ident* customers from a total of 25 544 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Aciclovir* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Aciclovir* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	153	0	161 920
Type C	0	3	0	77 156

The substance/substance group *Aciclovir* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 96.0784 %)
Type C	100.0000 % (> 99.8854 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21677	21677	0.00	59.23
21761	21677	6.39	61.71
21831	21677	14.09	64.99

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Aescin**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20377-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Aescin; Aescinum

Special notes

When selecting the *Aescin* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Aescin*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Aescin	12K22-N13	21237	30	20121127
Euro OTC	Aescin	1310020-01	21238	20	AR-15-FG-005777-01
Euro OTC	Aescin	1506038	21838	40	20150708*
Fagron	Aescin	12I07-B40-306607	22610	40	1610369
Euro OTC	Aescin	1605021	22684	40	20160609*
Euro OTC	Aescin	1612012	22988	40	20170213*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 210 spectra of 6 reference samples from the substance/substance group *Aescin*. These samples are listed above in the section *calibration samples*. The reference samples originate from 6 different batches.

- 72 223 spectra from a total of 1576 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 170 spectra from 6 reference samples of the substance/substance group *Aescin*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Aescin	1011033-02	20377	40
Euro OTC	Aescin	1011033	20464	40
Fagron	Aescin	1011033-02	20580	40
Fagron	Aescin	12K22-N13	21237†	10
Euro OTC	Aescin	1310020-01	21238†	20
Euro OTC	Aescin	1506038	21838†	20

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 903 spectra from a total of 3494 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 5 spectra from 2 *Apo-Ident* customers from 4 batches from the substance/substance group *Aescin*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Euro OTC	Aescin	1612012-01	2
Euro OTC	Aescin	1310020-01	1
Euro OTC	Aescin	1108038	1
Fagron	Aescin	30691/M3	1

- 77 154 spectra from 463 *Apo-Ident* customers from a total of 25 543 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Aescin* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Aescin* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	210	0	72 223
Type B	0	145	25	161 903
Type C	0	3	2	77 154

The substance/substance group *Aescin* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.1429 %)
Type B	100.0000 % (> 99.9928 %)	85.2941 % (> 83.5294 %)
Type C	100.0000 % (> 99.8852 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several

new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21237	21238	11.55	26.75
21238	21238	0.00	18.72
21838	21838	0.00	29.08
22610	22610	0.00	29.57
22684	22684	0.00	25.31
22988	22988	0.00	25.63

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Albendazole**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	21596-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Albendazole; Albendazolum

Special notes

When selecting the *Albendazole* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Albendazole*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Albendazole	12J25-B40-293217	21596	40	AR-15-FG-002571-01
Fagron	Albendazole	14B05-B41-299704	21730	40	20140430
Fagron	Albendazole	16B04-B06-322057	22968	40	20160302

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Albendazole*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 120 spectra from 4 reference samples of the substance/substance group *Albendazole*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Albendazole	12J25-B40-293217	21596†	20
Fagron	Albendazole	14B05-B41-299704	21730†	20
Fagron	Albendazole	14B05-B41-314321	22940	40
Fagron	Albendazole	16B04-B06-329519	23017	40

- 161 953 spectra from a total of 3495 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 4 spectra from 4 *Apo-Ident* customers from 4 batches from the substance/substance group *Albendazole*.

- These include spectra of independent samples from 4 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Albendazole	`14B05-B41`	1
Fagron	Albendazole	`14B05B41-312959`	1
Fagron	Albendazole	`14b05-b41-314321`	1
Fagron	Albendazole	`14B05-B41-314321`	1

- 77 155 spectra from 463 *Apo-Ident* customers from a total of 25 543 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Albendazole* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Albendazole* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	120	0	161 953
Type C	0	4	0	77 155

The substance/substance group *Albendazole* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 95.0000 %)
Type C	100.0000 % (> 99.8853 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21596	21596	0.00	68.12
21730	21596	13.22	74.82
22968	21596	11.98	75.00

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Alfatradiol**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20292-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Alfatradiol; 17-alpha-Estradiolum; Alfatradiolum

Special notes

When selecting the *Alfatradiol* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Alfatradiol*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Alfatradiol	13G19-N06	20940	40	1402683
Caelo	Alfatradiol	13201601	21476	80	20130812
Euro OTC	Alfatradiol	1404001-01	21714	40	1509288
Euro OTC	Alfatradiol	1603019	22511	40	20160419*
Fagron	Alfatradiol	15J27-B08-323877	22934	40	20151117

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Alfatradiol	1404001-01	21714SI	40	1509288
Euro OTC	Alfatradiol	1603019	22511SI	40	20160419*
Fagron	Alfatradiol	15J27-B08-323877	22934SI	40	20151117

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 360 spectra of 8 reference samples from the substance/substance group *Alfatradiol*. These samples are listed above in the section *calibration samples*. The reference samples originate from 5 different batches.

- 72 073 spectra from a total of 1577 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 550 spectra from 14 reference samples of the substance/substance group *Alfatradiol*.

- These include spectra of independent samples from 5 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Alfatradiol	11B07-N05	20194	40
Caelo	Alfatradiol	11061005	20292	40
Fagron	Alfatradiol	11G22-N11	20545	40
Caelo	Alfatradiol	13201601	21476†	40
Caelo	Alfatradiol	13201601	21477	60
Euro OTC	Alfatradiol	1404001-01	21714†	10

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*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Alfatradiol	15J27-B08-323877	22933	40
Audor Pharma	Alfatradiol	AP33-16-I-62P2985A	22935	40
Caelo	Alfatradiol	161804	23354	40
Caelo	Alfatradiol	13201601	21477SI	60
Euro OTC	Alfatradiol	1404001-01	21714SI[†]	20
Fagron	Alfatradiol	15J27-B08-323877	22933SI	40
Audor Pharma	Alfatradiol	AP33-16-I-62P2985A	22935SI	40
Caelo	Alfatradiol	161804	23354SI	40

- 161 523 spectra from a total of 3491 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 267 spectra from 121 *Apo-Ident* customers from 105 batches from the substance/substance group *Alfatradiol*.

- These include spectra of independent samples from 103 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Alfatradiol	13130805	6
VDL 1.7.14;40.30 euro	Alfatradiol	13G19-N06	1
Audor Pharma	Alfatradiol	APXPC0071A	3
Fagron	Alfatradiol	14C20-B02-294944	2
Fagron	Alfatradiol	12H29-N05	6
Fagron	Alfatradiol	13G19-N06	21
Fagron	Alfatradiol	12L19-N08	8
Caelo	Alfatradiol	13201605	7
Audor Pharma	Alfatradiol	APXP103DAA	2
Caelo	Alfatradiol	5051406	1
Caelo	Alfatradiol	2061504	1
Fagron	Alfatradiol	12J27-B08-314546	1
Sanacorp	Alfatradiol	13201605	1
Fagron	Alfatradiol	13201605	1
Fagron	Alfatradiol		1
Fagron	Alfatradiol	13L30-B32	3
Fagron	Alfatradiol	13L30-B32-290739	1
Fagron	Alfatradiol	13L30B32	1
Fagron	Alfatradiol	13L30-B32-290742	1
Fagron	Alfatradiol	14/22-B30-302017	1
Fagron	Alfatradiol	13130b32290742	1
Euro OTC	Alfatradiol	1404001-01	1
Caelo	Alfatradiol	14037904	4

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[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Supplier	Substance	Batch	Spectra
Caelo	Alfatradiol	14130104	1
Caelo	Alfatradiol	14139102	2
Caelo	Alfatradiol	14139103	6
Caelo	Alfatradiol	14139104	11
Caelo	Alfatradiol	14139105	2
Fagron	Alfatradiol	1422B30302019	1
Caelo	Alfatradiol	14318512	1
Caelo	Alfatradiol	14318502	1
Fagron	Alfatradiol	14C20-B02-294943	1
Anzag / Gehe	Alfatradiol	14C20-B02-294943	1
Caelo	Alfatradiol	14C20-B02-294943	2
Fagron	Alfatradiol	14722-B30-302018	1
Caelo	Alfatradiol	14C20-B02-294944	1
Fagron	Alfatradiol	14G07-B99	1
Fagron	Alfatradiol	14G07-B99-294945	4
Fagron	Alfatradiol	14G07-B99-294942	1
Fagron	Alfatradiol	14I22-B30-302017	1
Sanacorp;21.7.15;42,35EUR	Alfatradiol	14l22-B30-302018	1
Caelo	Alfatradiol	14I22-B30-302019	1
Caelo	Alfatradiol	15356801	8
Phönix	Alfatradiol	15356801	1
Sanacorp	Alfatradiol	15356804	1
Caelo	Alfatradiol	15356804	3
Caelo	Alfatradiol	15380001	7
Fagron	Alfatradiol	15G07-B01	1
Caelo	Alfatradiol	1536801	1
Fagron	Alfatradiol	15G07-B01-310227	4
Caelo	Alfatradiol	15G07-B01-310227	1
Fagron	Alfatradiol	15G07-B01-310229	3
Fagron	Alfatradiol	15G07-B01-310228	1
Fagron	Alfatradiol	15G07-B01-311881	1
Caelo	Alfatradiol	15G07-B01-311881	1
Fagron	Alfatradiol	15J27-B08	3
Fagron	Alfatradiol	15j27-B08-314546	1
Fagron	Alfatradiol	15J27B08318164	1
Fagron	Alfatradiol	15J27-B08-321786	1
Fagron	Alfatradiol	15J27-B08-318783	1
Gehe	Alfatradiol	16087501	1
Fagron	Alfatradiol	16G05-B01-326866	1
Caesar&Lorenz/Phoenix	Alfatradiol	16087502	1
Caelo	Alfatradiol	16087501	1
Fagron	Alfatradiol	5102423	1
Fagron	Alfatradiol	16g05-b01-324614	1
Fagron	Alfatradiol	16G05-B01-324614	1
Audor Pharma	Alfatradiol	33-16-I-62P2985A	1
Sanacorp, 39,57EUR, 27.1.17	Alfatradiol	700670-0011	1
Fagron	Alfatradiol	16G05-B01-335789	1
Shandong northwest manu…	Alfatradiol	AEC151211	1
Shandong Northwest Manu…	Alfatradiol	AEC160522	1
Kwizda	Alfatradiol	529068	1
Audor Pharma	Alfatradiol	AP1404001-01A	1
Audor Pharma	Alfatradiol	AP1504015-01A	3
Audor Pharma	Alfatradiol	AP5100461A	5
Audor Pharma	Alfatradiol	AP33-16-I-42P2945A	2
Audor Pharma	Alfatradiol	AP33-16-I-62P2985A	2
Audor Pharma	Alfatradiol	AP5104925A	6
Phönix	Alfatradiol	APXPC0071A	1
Audor Pharma	Alfatradiol	APXPC0071	1
Audor Pharma	Alfatradiol	AP3316I62P2985A	1
Sanacorp	Alfatradiol	AP5104925A	1

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Supplier	Substance	Batch	Spectra
Audor Pharma	Alfatradiol	AP514925A	1
Caelo	Alfatradiol	511211	1
carlo	Alfatradiol	10319903	1
Caelo	Alfatradiol	10319904	1
Caelo	Alfatradiol	10319909	1
Caelo	Alfatradiol	11061001	2
Caelo	Alfatradiol	11161805	6
Caesar/Lorenz	Alfatradiol	11061001	1
Caelo	Alfatradiol	111161607	1
Caelo	Alfatradiol	11061005	1
Caelo	Alfatradiol	11161807	4
Fagron	Alfatradiol	11B07-N05	1
Fagron	Alfatradiol	11G22-N11	3
Fagron	Alfatradiol	11D07-N19	1
Fagron	Alfatradiol	11K25-N01	3
Fagron	Alfatradiol	11k25-N01	1
Großhandel	Alfatradiol	12164201	1
Caelo	Alfatradiol	12164201	5
Caelo	Alfatradiol	12164207	9
Caesar&Loretz GmbH/Anzag	Alfatradiol	12164207	1
Euro OTC	Alfatradiol	121696	1
Fagron	Alfatradiol	12D19-N03	6
Noweda	Alfatradiol	12D19-N03	2
Phoenix	Alfatradiol	12D19-NO3	1
Caelo	Alfatradiol	12H29N05	1
Fagron	Alfatradiol	12L10-N08	1
Hirsch	Alfatradiol	12L19-N08	2
Fagron	Alfatradiol	12L19-No8	1
Caelo	Alfatradiol	13130806	2
Caelo	Alfatradiol	13130808	4
Fagron	Alfatradiol	13G19-N06	1
Fagron	Alfatradiol	13G19-N09	1
Fagron	Alfatradiol	13L30B32-290741	1
Fagron	Alfatradiol	13G19-No6	1
Audor Pharma	Alfatradiol	AP9374-2/10A	1
Audor Pharma	Alfatradiol	ap9374311a	1
Audor Pharma	Alfatradiol	AP9374-3/11A	1
Fagron	Alfatradiol	XP101UT	1
Caelo	Alfatradiol	11061004	1
Audor Pharma	Alfatradiol	XP103DAA	1

- 76 892 spectra from 463 *Apo-Ident* customers from a total of 25 443 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Alfatradiol* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Alfatradiol* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	360	0	72 073
Type B	0	550	0	161 523
Type C	0	248	19	76 892

The substance/substance group *Alfatradiol* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9887 %)	100.0000 % (> 98.3333 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 98.9091 %)
Type C	100.0000 % (> 99.8850 %)	92.8839 % (> 91.7603 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20940	20940	0.00	27.18
21476	22511	5.21	28.63
21714	21714	0.00	27.47
22511	22511	0.00	26.75
22934	22511	2.82	26.87

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Allantoin**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20079-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Allantoin; Allantoinum

Special notes

When selecting the *Allantoin* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Allantoin*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Allantoin	13I03-B05	21216	40	20130927
Euro OTC	Allantoin	1406011-01	21625	40	20140718
Euro OTC	Allantoin	1609012	22750	40	20161006*
Euro OTC	Allantoin	1609012-01	22810	40	20161006

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 4 reference samples from the substance/substance group *Allantoin*. These samples are listed above in the section *calibration samples*. The reference samples originate from 4 different batches.

- 72 273 spectra from a total of 1578 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 220 spectra from 6 reference samples of the substance/substance group *Allantoin*.

- These include spectra of independent samples from 4 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Allantoin	91749379	20079	40
Euro OTC	Allantoin	1406011-01	21625†	20
Caelo	Allantoin	162289	22756	40
Caelo	Allantoin	172346	23629	40
Caelo	Allantoin	172346	23635	40
Euro OTC	Allantoin	1406011-04	24095	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 853 spectra from a total of 3494 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 284 spectra from 99 *Apo-Ident* customers from 78 batches from the substance/substance group *Allantoin*.

- These include spectra of independent samples from 76 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Allantoin	3091301	1
Caelo	Allantoin	5051402	1
Caelo	Allantoin	10064012	1
Caelo	Allantoin	2264594	1
Caelo	Allantoin	10064015	1
Caelo	Allantoin	10318304	2
Caelo	Allantoin	10064008	1
Caelo	Allantoin	10318313	2
Caelo	Allantoin	10318305	1
Caelo	Allantoin	10318312	1
Caelo	Allantoin	1113E-01087	1
Anzag	Allantoin	10318315	1
Caelo	Allantoin	11247504	7
Caelo	Allantoin	11247510	5
Caelo	Allantoin	11247511	2
Fagron	Allantoin	11J11-N11	3
Noweda	Allantoin	11J11-N11	1
Caelo	Allantoin	12251501	6
Caelo	Allantoin	1225101	1
Anzag	Allantoin	12251501	1
Sanacorp	Allantoin	12251501	1
Caelo	Allantoin	12251502	2
Caesar & Loretz GmbH	Allantoin	12251505	1
Caelo	Allantoin	12251505	10
DSM Nutritional Prod./ ...	Allantoin	12251505	1
Caelo	Allantoin	12251509	1
Caelo	Allantoin	12251510	11
Caesar & Loretz GmbH	Allantoin	12251510	1
Sanacorp	Allantoin	12251510	1
Gehe	Allantoin	12251510	1
Caelo	Allantoin	12374403	8
Caesar & Loretz GmbH	Allantoin	12374403	1
celo/Jenne	Allantoin	12374403	1
Caelo	Allantoin	12374404	2
Caelo	Allantoin	12374407	6
Caelo	Allantoin	12374408	1
Caelo	Allantoin	12374409	17
Sanacorp	Allantoin	12374409	2
Caesar & Loretz GmbH	Allantoin	12374409	1
Caelo	Allantoin	12374414	9
Caesar&Loretz GmbH	Allantoin	12374409	1

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Supplier	Substance	Batch	Spectra
Caelo	Allantoin	12374415	14
Caesar & Loretz GmbH	Allantoin	12374416	1
Caesar & Loretz GmbH	Allantoin	12374415	1
Caelo	Allantoin	12374418	2
Caelo	Allantoin	12374417	1
Caelo	Allantoin	12374422	7
Sanacorp	Allantoin	12374422	1
Caelo	Allantoin	12374423	4
Noweda	Allantoin	12B09-N08	2
Fagron	Allantoin	12B09-N09	1
Fagron	Allantoin	12C30-N04	2
Caelo	Allantoin	12bo9-no8	1
Noweda	Allantoin	13A21-N07	2
Fagron	Allantoin	13A21-N07	3
Fagron	Allantoin	13G16-N07	8
Fargron/AHD	Allantoin	13G16-N07	1
Euro OTC	Allantoin	1401046-01	4
Fagron	Allantoin	13I03-B05-289430	1
Euro OTC	Allantoin	1406011-01	7
Phoenix 08.10.14	Allantoin	1401046-01	1
Caelo	Allantoin	140512	1
Euro OTC	Allantoin	140104601	1
EuRho / Phoenix	Allantoin	1406011-03	1
Euro OTC	Allantoin	140601103	1
Euro OTC	Allantoin	1406011-02	1
Caelo	Allantoin	14247602	8
Caesar & Loretz GmbH	Allantoin	14247602	1
Gehe	Allantoin	14247603	1
Caelo	Allantoin	14247609	6
Caelo	Allantoin	152200012	1
Caelo	Allantoin	15220004	3
Caelo	Allantoin	15220005	2
Caelo	Allantoin	15220006	14
Caelo	Allantoin	15220007	6
Caelo	Allantoin	15220008	9
Caelo	Allantoin	15220010	3
Caelo	Allantoin	15220011	2
Caelo	Allantoin	15220012	8
Caelo	Allantoin	15275302	1
Caelo	Allantoin	16228903	5
Caelo	Allantoin	15275312	1
Caelo	Allantoin	15275305	1
Caelo	Allantoin	16228904	1
Caelo	Allantoin	20140612-15	1
Caelo	Allantoin	20071202	1
Caelo	Allantoin	24061401	1
Caelo	Allantoin	2713448	1
Fagron	Allantoin	5011E-01087	1
Fagron	Allantoin	16228903	1
Caelo	Allantoin	2713431	1
AHD	Allantoin	1609012-01	1
Caelo	Allantoin	81542358	4
Fagron	Allantoin	K93403115	1
Caelo	Allantoin	12374416	1
Anzag;18.03.15;2,76EUR	Allantoin	14247602	2
AHD	Allantoin	14247603	3
Caelo	Allantoin	10318306	1
Caelo	Allantoin	12374401	1
Caelo	Allantoin	12251511	1
Caelo	Allantoin	4908E-01087	1

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- 76 875 spectra from 463 *Apo-Ident* customers from a total of 25 470 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Allantoin* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Allantoin* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	72 273
Type B	0	188	32	161 853
Type C	0	269	15	76 875

The substance/substance group *Allantoin* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9928 %)	85.4545 % (> 84.0909 %)
Type C	100.0000 % (> 99.8850 %)	94.7183 % (> 93.6620 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21216	22750	10.52	43.49
21625	22750	9.36	43.07
22750	22750	0.00	42.90
22810	22750	5.54	43.78

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Allopurinol**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	22243-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Allopurinol; Allopurinolum

Special notes

When selecting the *Allopurinol* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Allopurinol*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Allopurinol	14E15-B05-307746	22243	40	AR-16-FG-004367-01
Fagron	Allopurinol	14E15-B05-315557	22345	40	20140611

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 80 spectra of 2 reference samples from the substance/substance group *Allopurinol*. These samples are listed above in the section *calibration samples*. The reference samples originate from 2 different batches.

- 72 353 spectra from a total of 1580 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 173 spectra from 6 reference samples of the substance/substance group *Allopurinol*.

- These include spectra of independent samples from 1 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Allopurinol	14E15-B05-307746	22243†	20
Fagron	Allopurinol	14E15-B05-315557	22345†	20
Fagron	Allopurinol	14E15-B05-307746	22836	40
Fagron	Allopurinol	14E15-B05-330859	23523	40
Fagron	Allopurinol	14E15-B05-330859	23526	40
Fagron	Allopurinol	14E15-B05-315557	not required	13

- 161 900 spectra from a total of 3496 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 0 spectra from 0 *Apo-Ident* customers from 0 batches from the substance/substance group *Allopurinol*.

- These include spectra of independent samples from 0 batches, of which no spectra have been used for the generation of the database.

- 77 159 spectra from 463 *Apo-Ident* customers from a total of 25 547 batches from a further 701 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Allopurinol* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Allopurinol* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	72 353
Type B	0	173	0	161 900
Type C	0	0	0	77 159

The substance/substance group *Allopurinol* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 96.5318 %)
Type C	100.0000 % (> 99.8849 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
22243	22243	0.00	91.54
22345	22243	2.75	89.37

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**alpha-tocopheryl acetate dry concentrate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20433-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

alpha-tocopheryl acetate dry concentrate; alpha-Tocopheroli acetas pulvis; alpha-Tocopherolum aceticum siccatum

Special notes

When selecting the *alpha-tocopheryl acetate dry concentrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *alpha-tocopheryl acetate dry concentrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	alpha-tocopheryl…	1110021-02	20907	40	20120104
Fagron	alpha-tocopheryl…	13H30-B02-287169	21609	40	AR-15-FG-006388-01
Euro OTC	alpha-tocopheryl…	1305032-01	21680	40	AR-15-FG-001194-01
Euro OTC	alpha-tocopheryl…	1507001	21842	40	20130708*
Fagron	alpha-tocopheryl…	14B03-B04-295113	21959	40	20140224
Euro OTC	alpha-tocopheryl…	1603046	22543	40	20160429*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 240 spectra of 6 reference samples from the substance/substance group *alpha-tocopheryl acetate dry concentrate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 6 different batches.

- 72 193 spectra from a total of 1576 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 200 spectra from 7 reference samples of the substance/substance group *alpha-tocopheryl acetate dry concentrate*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Bulk Medicines & Pharma…	alpha-tocopheryl acetate dry…	2009060301	20433	40
Fagron	alpha-tocopheryl acetate dry…	13H30-B02-287169	21609†	20
Euro OTC	alpha-tocopheryl acetate dry…	1305032-01	21680†	20
Euro OTC	alpha-tocopheryl acetate dry…	1507001	21842†	20
Fagron	alpha-tocopheryl acetate dry…	14B03-B04-295113	21959†	20
Fagron	alpha-tocopheryl acetate dry…	16H30-B05-326792	22948	40
Euro OTC	alpha-tocopheryl acetate dry…	1705003	23424	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 873 spectra from a total of 3492 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 21 spectra from 6 *Apo-Ident* customers from 14 batches from the substance/substance group *alpha-tocopheryl acetate dry concentrate*.

- These include spectra of independent samples from 11 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Euro OTC	alpha-tocopheryl acetate dry…	1305032-02	1
Euro OTC	alpha-tocopheryl acetate dry…	1305032-01	2
Fagron	alpha-tocopheryl acetate dry…	13g19-n04	1
Fagron	alpha-tocopheryl acetate dry…	13G19-N04	1
Fagron	alpha-tocopheryl acetate dry…	13H30-B02-287169	1
Euro OTC	alpha-tocopheryl acetate dry…	1406013-01	3
Euro OTC	alpha-tocopheryl acetate dry…	1110021-02	2
Euro OTC	alpha-tocopheryl acetate dry…	1406013-03	3
Euro OTC	alpha-tocopheryl acetate dry…	1507001-01	2
Euro/Sanacorp	alpha-tocopheryl acetate dry…	150700101	1
Bombastus	alpha-tocopheryl acetate dry…	1507001-02	1
Euro OTC	alpha-tocopheryl acetate dry…	7120	1
Euro OTC	alpha-tocopheryl acetate dry…	1110021-01	1
BMP	alpha-tocopheryl acetate dry…	2011052301	1

- 77 138 spectra from 463 *Apo-Ident* customers from a total of 25 534 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *alpha-tocopheryl acetate dry concentrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *alpha-tocopheryl acetate dry concentrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	240	0	72 193
Type B	0	160	40	161 873
Type C	0	17	4	77 138

The substance/substance group *alpha-tocopheryl acetate dry concentrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.5000 %)
Type B	100.0000 % (> 99.9928 %)	80.0000 % (> 78.5000 %)
Type C	100.0000 % (> 99.8850 %)	80.9524 % (> 66.6667 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20907	21680	4.97	40.83
21609	21609	0.00	43.98
21680	21680	0.00	40.64
21842	21842	0.00	43.61
21959	21680	4.78	40.89
22543	22543	0.00	43.51

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Ambroxol hydrochloride**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20742-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Ambroxol hydrochloride; Ambroxoli hydrochloridum; Ambroxolum hydrochloricum

Special notes

When selecting the *Ambroxol hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Ambroxol hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Ambroxol hydroch…	11110008-01	20742	40	1401146
Fagron	Ambroxol hydroch…	13I24-N02	21230	40	20131017
Euro OTC	Ambroxol hydroch…	1311032-01	21244	40	20131219
Euro OTC	Ambroxol hydroch…	1509032	21942	40	20151027*
Euro OTC	Ambroxol hydroch…	1601008	22298	40	20160119*
Euro OTC	Ambroxol hydroch…	1602015	22347	40	20160217*
Euro OTC	Ambroxol hydroch…	1604035	22550	40	20160428*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 280 spectra of 7 reference samples from the substance/substance group *Ambroxol hydrochloride*. These samples are listed above in the section *calibration samples*. The reference samples originate from 7 different batches.

- 72 153 spectra from a total of 1575 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 300 spectra from 9 reference samples of the substance/substance group *Ambroxol hydrochloride*.

- These include spectra of independent samples from 6 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Ambroxol hydrochloride	1509032	21942†	20
Euro OTC	Ambroxol hydrochloride	1601008	22298†	20
Euro OTC	Ambroxol hydrochloride	1602015	22347†	20
Caelo	Ambroxol hydrochloride	161996	22636	40
Euro OTC	Ambroxol hydrochloride	1609002	22800	40
Euro OTC	Ambroxol hydrochloride	1702004	23155	40
Caelo	Ambroxol hydrochloride	171582	23344	40
Caelo	Ambroxol hydrochloride	172860	23801	40
Euro OTC	Ambroxol hydrochloride	1711021	23894	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 773 spectra from a total of 3490 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 64 spectra from 23 *Apo-Ident* customers from 23 batches from the substance/substance group *Ambroxol hydrochloride*.

- These include spectra of independent samples from 22 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
EuroTOC	Ambroxol hydrochloride	1602015-01	1
Euro OTC	Ambroxol hydrochloride	1411007-01	1
Euro OTC	Ambroxol hydrochloride	1509032-01	1
Euro OTC	Ambroxol hydrochloride	16000201	1
Fagron	Ambroxol hydrochloride	1602015-01	1
EuRho	Ambroxol hydrochloride	1602015-02	3
Euro/Noweda	Ambroxol hydrochloride	1509032-01	1
Caelo	Ambroxol hydrochloride	1602015-02	1
Euro OTC	Ambroxol hydrochloride	1311032-01	1
Euro OTC	Ambroxol hydrochloride	1602015-02	4
Euro OTC	Ambroxol hydrochloride	1604032-01	1
Euro OTC	Ambroxol hydrochloride	1604031-01	1
Euro OTC	Ambroxol hydrochloride	1604035-01	3
Euro OTC	Ambroxol hydrochloride	1604035-02	11
Phoenix	Ambroxol hydrochloride	1604035-02	1
Sanacorp	Ambroxol hydrochloride	1604035-02	1
Euro OTC	Ambroxol hydrochloride	1609002	1
Euro OTC	Ambroxol hydrochloride	1609002-01	3
Caelo	Ambroxol hydrochloride	1609002-01	3
Euro OTC	Ambroxol hydrochloride	1609002-02	8
Caelo	Ambroxol hydrochloride	16199601	1
Caelo	Ambroxol hydrochloride	16199603	2
Fagron	Ambroxol hydrochloride	16G12-B06-326184	1
Euro OTC	Ambroxol hydrochloride	1702004-01	3
Caelo	Ambroxol hydrochloride	17002904	1
Euro OTC	Ambroxol hydrochloride	1702004-02	2
Caelo	Ambroxol hydrochloride	1702004-02	1
Euro OTC	Ambroxol hydrochloride	170200402	1
Chem & Pharma	Ambroxol hydrochloride	AXL0361201310	1
Fagron	Ambroxol hydrochloride	12K12-N02	1
Caelo	Ambroxol hydrochloride	1604035-01	1
Caelo	Ambroxol hydrochloride	17286001	1

- 77 095 spectra from 463 *Apo-Ident* customers from a total of 25 525 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model,

the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Ambroxol hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ambroxol hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	280	0	72 153
Type B	0	300	0	161 773
Type C	0	64	0	77 095

The substance/substance group *Ambroxol hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.8571 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 98.0000 %)
Type C	100.0000 % (> 99.8850 %)	100.0000 % (> 90.6250 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20742	20742	0.00	38.42
21230	22347	3.40	38.16
21244	22347	3.07	38.18
21942	21942	0.00	40.16
22298	22298	0.00	38.18
22347	22347	0.00	37.32
22550	22550	0.00	37.67

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Amiloride hydrochloride**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	21879-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Amiloride hydrochloride; Amiloridi hydrochloridum dihydricum; Amiloridum hydrochloricum dihydricum

Special notes

When selecting the *Amiloride hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Amiloride hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Amiloride hydroc…	13J08-B04-288620	21879	40	AR-16-FG-008919-01
Fagron	Amiloride hydroc…	13J08-B04-304547	22339	40	20131024
Fagron	Amiloride hydroc…	16K07-B02-329114	23119	40	20170104

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Amiloride hydrochloride*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 120 spectra from 4 reference samples of the substance/substance group *Amiloride hydrochloride*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Amiloride hydrochloride	13J08-B04-288620	21879†	20
Fagron	Amiloride hydrochloride	13J08-B04-304547	22339†	20
Fagron	Amiloride hydrochloride	15C25-B05-325653	22834	40
Fagron	Amiloride hydrochloride	17F02-B06-335953	23525	40

- 161 953 spectra from a total of 3495 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 1 spectra from 1 *Apo-Ident* customers from 1 batches from the substance/substance group *Amiloride hydrochloride*.

- These include spectra of independent samples from 1 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Ebert 04.04.2014	Amiloride hydrochloride	13J08-B04	1

- 77 158 spectra from 463 *Apo-Ident* customers from a total of 25 546 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Amiloride hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Amiloride hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	114	6	161 953
Type C	0	1	0	77 158

The substance/substance group *Amiloride hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	95.0000 % (> 92.5000 %)
Type C	100.0000 % (> 99.8862 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21879	21879	0.00	55.11
22339	21879	7.15	49.22
23119	21879	15.16	51.98

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Amitriptyline hydrochloride**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	22844-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Amitriptyline hydrochloride; Amitriptylini hydrochloridum; Amitriptylinum hydrochloricum

Special notes

When selecting the *Amitriptyline hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Amitriptyline hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Amitriptyline hy…	16C31-B01-325540	22844	40	20160425
Inresa	Amitriptyline hy…	005669/17112016	22845	40	1705099

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 80 spectra of 2 reference samples from the substance/substance group *Amitriptyline hydrochloride*. These samples are listed above in the section *calibration samples*. The reference samples originate from 2 different batches.

- 72 353 spectra from a total of 1580 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 80 spectra from 2 reference samples of the substance/substance group *Amitriptyline hydrochloride*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Inresa	Amitriptyline hydrochloride	005669/06022017	23078	40
Fagron	Amitriptyline hydrochloride	17E11-B02-335098	23528	40

- 161 993 spectra from a total of 3497 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

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- 0 spectra from 0 *Apo-Ident* customers from 0 batches from the substance/substance group *Amitriptyline hydrochloride*.

- These include spectra of independent samples from 0 batches, of which no spectra have been used for the generation of the database.

- 77 159 spectra from 463 *Apo-Ident* customers from a total of 25 547 batches from a further 701 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Amitriptyline hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Amitriptyline hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	72 353
Type B	0	80	0	161 993
Type C	0	0	0	77 159

The substance/substance group *Amitriptyline hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 92.5000 %)
Type C	100.0000 % (> 99.8849 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
22844	22845	14.50	67.32
22845	22845	0.00	66.87

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Amphotericin B**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20933-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Amphotericin B; Amphotericinum B

Special notes

When selecting the *Amphotericin B* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Amphotericin B*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Amphotericin B	1305033-02	20933	40	1403224
Fagron	Amphotericin B	13I16-N02	21338	40	1508271
Fagron	Amphotericin B	13I16-N02	21951	40	20130911

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Amphotericin B*. These samples are listed above in the section *calibration samples*. The reference samples originate from 2 different batches.

- 72 313 spectra from a total of 1580 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 152 spectra from 5 reference samples of the substance/substance group *Amphotericin B*.

- These include spectra of independent samples from 4 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Amphotericin B	13I16-N02	21951†	20
Euro OTC	Amphotericin B	1512026-01	22813	40
Fagron	Amphotericin B	16L06-B04-333234	23530	40
Euro OTC	Amphotericin B	1803036	24065	40
Euro OTC	Amphotericin B	1305033-03	not required	12

- 161 921 spectra from a total of 3494 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 4 spectra from 3 *Apo-Ident* customers from 3 batches from the substance/substance group *Amphotericin B*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Euro OTC	Amphotericin B	1512026-01	2
Fagron	Amphotericin B	16D05-B04	1
Fagron	Amphotericin B	5173	1

- 77 155 spectra from 463 *Apo-Ident* customers from a total of 25 544 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Amphotericin B* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Amphotericin B* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	151	1	161 921
Type C	0	4	0	77 155

The substance/substance group *Amphotericin B* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	99.3421 % (> 97.3684 %)
Type C	100.0000 % (> 99.8853 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20933	20933	0.00	18.83
21338	21338	0.00	25.78
21951	21338	1.24	26.08

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Arginine**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20391-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Arginine; Argininum

Special notes

When selecting the *Arginine* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Arginine*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Arginine	13J28-B02	21226	40	AR-15-FG-008045-01
Euro OTC	Arginine	1604003	22514	40	20160425*
Euro OTC	Arginine	1608031	22801	40	20160916*
Euro OTC	Arginine	1702014	23154	40	20170316*
Fagron	Arginine	16H24-B04-335673	23748	40	20161010

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 200 spectra of 5 reference samples from the substance/substance group *Arginine*. These samples are listed above in the section *calibration samples*. The reference samples originate from 5 different batches.

- 72 233 spectra from a total of 1577 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 220 spectra from 5 reference samples of the substance/substance group *Arginine*.

- These include spectra of independent samples from 5 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Arginine	L11070165	20391	40
Fagron	Arginine	10H11-N05	20416	40
Fagron	Arginine	11H01-N05	20435	40
Euro OTC	Arginine	L1405020-01	21712	60
Euro OTC	Arginine	1710010	23774	40

- 161 853 spectra from a total of 3494 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B*

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 35 spectra from 10 *Apo-Ident* customers from 21 batches from the substance/substance group *Arginine*.

- These include spectra of independent samples from 21 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Arginine	1410018-01	1
Euro OTC	Arginine	L1405020-01	4
Fagron	Arginine	14B25-B04	2
Euro OTC	Arginine	1604003-01	1
Euro OTC	Arginine	L1503033-01	3
Euro OTC	Arginine	L1410018-01	2
Fagron	Arginine	14I24-B08-303901	1
Euro OTC	Arginine	L1510019-01	1
Euro OTC	Arginine	L1311033-01	2
Euro OTC	Arginine	1105040-01	1
Fagron	Arginine	13/24-N01	1
Phönix 17.09.12	Arginine	1110017-01	1
Euro OTC	Arginine	L1209035-01	1
Fagron	Arginine	13I24-N01	1
Euro OTC	Arginine	L1206006-01	2
Euro OTC	Arginine	L1102030-01	2
Fagron	Arginine	13F14-N02	2
Euro OTC	Arginine	L1302006-01	2
Phönix	Arginine	L1302006-01	1
Fargon	Arginine	121429	1
Fagron	Arginine	12C21-N04	2
Fagron	Arginine	13J28-B02-290463	1

- 77 124 spectra from 463 *Apo-Ident* customers from a total of 25 526 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Arginine* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Arginine* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	200	0	72 233
Type B	0	220	0	161 853
Type C	0	35	0	77 124

The substance/substance group *Arginine* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 97.2727 %)
Type C	100.0000 % (> 99.8850 %)	100.0000 % (> 82.8571 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21226	21226	0.00	38.96
22514	22514	0.00	35.84
22801	22801	0.00	37.04
23154	23154	0.00	37.50
23748	21226	5.66	38.42

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Arginine hydrochloride**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20657-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Arginine hydrochloride; Arginini hydrochloridum; Argininum hydrochloricum

Special notes

When selecting the *Arginine hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Arginine hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Arginine hydroch…	L1103042-01	20657	40	20110325
Euro OTC	Arginine hydroch…	L1212009-01	20964	40	1402430
Euro OTC	Arginine hydroch…	1306023-01	21776	40	AR-15-FG-008412-01

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Arginine hydrochloride*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 140 spectra from 4 reference samples of the substance/substance group *Arginine hydrochloride*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Arginine hydrochloride	1306023-01	21776†	20
Euro OTC	Arginine hydrochloride	1603033	22512	40
Euro OTC	Arginine hydrochloride	1610042	22877	40
Euro OTC	Arginine hydrochloride	1711014	23875	40

- 161 933 spectra from a total of 3495 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 18 spectra from 6 *Apo-Ident* customers from 13 batches from the substance/substance group *Arginine hydrochloride*.

- These include spectra of independent samples from 11 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Hirundo Products Vertri…	Arginine hydrochloride	6412784-152	2
EuRho	Arginine hydrochloride	1306023-01	1
Fagron	Arginine hydrochloride	13J28-B03	2
Fagron	Arginine hydrochloride	13J28-B03-287766	1
Fagron	Arginine hydrochloride	12C20-N08	1
Euro OTC	Arginine hydrochloride	L1407040-02	1
Euro OTC	Arginine hydrochloride	L1407040-01	1
Fagron	Arginine hydrochloride	13J28-B032x	1
Euro OTC	Arginine hydrochloride	1306023-01	1
Euro OTC	Arginine hydrochloride	L1212009-01	3
Fagron	Arginine hydrochloride	13j28-B03-287768	1
Fagron	Arginine hydrochloride	12G25-N13	1
Euro OTC	Arginine hydrochloride	L1506023-01	1
Fagron	Arginine hydrochloride	13j28-b03-287768	1

- 77 141 spectra from 463 *Apo-Ident* customers from a total of 25 534 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Arginine hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Arginine hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	140	0	161 933
Type C	0	17	1	77 141

The substance/substance group *Arginine hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 95.7143 %)
Type C	100.0000 % (> 99.8850 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several

new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20657	21776	11.50	48.50
20964	20964	0.00	48.60
21776	21776	0.00	47.04

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Ascorbic acid**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20394-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Ascorbic acid; Acidum ascorbicum; Acidum ascorbinicum

Special notes

When selecting the *Ascorbic acid* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Ascorbic acid*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Ascorbic acid	13G29-B07	21229	40	1410500
Caelo	Ascorbic acid	12350011	21317	40	20121122
Euro OTC	Ascorbic acid	1612018	22918	40	20170109*
Caelo	Ascorbic acid	163452	23062	40	20170125*
Caelo	Ascorbic acid	171358	23293	40	20170524*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 200 spectra of 5 reference samples from the substance/substance group *Ascorbic acid*. These samples are listed above in the section *calibration samples*. The reference samples originate from 5 different batches.

- 72 233 spectra from a total of 1577 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 440 spectra from 11 reference samples of the substance/substance group *Ascorbic acid*.

- These include spectra of independent samples from 10 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Ascorbic acid	09306404	20394	40
Hebei Welcome Pharmaceu…	Ascorbic acid	1107411106	20430	40
Euro OTC	Ascorbic acid	1607025	22672	40
Euro OTC	Ascorbic acid	1605024	22680	40
Euro OTC	Ascorbic acid	1609015	22789	40
Euro OTC	Ascorbic acid	1703040	23128	40
Euro OTC	Ascorbic acid	1703025	23144	40
Caelo	Ascorbic acid	171358	23288	40
Euro OTC	Ascorbic acid	1707005	23553	40
Euro OTC	Ascorbic acid	1708026	23701	40
Euro OTC	Ascorbic acid	1710032	23891	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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- 161 633 spectra from a total of 3488 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 76 spectra from 42 *Apo-Ident* customers from 56 batches from the substance/substance group *Ascorbic acid*.

- These include spectra of independent samples from 55 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Ascorbic acid	14123809	2
Caelo	Ascorbic acid	15300002	3
Caelo	Ascorbic acid	1071404	1
Euro OTC	Ascorbic acid	1308008-01	1
Euro OTC	Ascorbic acid	12061408	1
pharmorgana	Ascorbic acid	1304413505	1
Caelo	Ascorbic acid	12350011	1
Caelo	Ascorbic acid	13341803/3	1
Euro OTC	Ascorbic acid	10071418	1
Caelo	Ascorbic acid	14123910	1
Caelo	Ascorbic acid	14123915	3
Caelo	Ascorbic acid	14214403	1
Caelo	Ascorbic acid	15084503	1
ACM	Ascorbic acid	Knc1035j16	1
Caelo	Ascorbic acid	15084507	1
Pharma Greven	Ascorbic acid	D201503108	1
ACM	Ascorbic acid	KNC1035J16	2
ACM	Ascorbic acid	KNC1488J14	6
Caelo	Ascorbic acid	16050403	2
Euro OTC	Ascorbic acid	17041406	1
Euro OTC	Ascorbic acid	L-1202011-02	1
Nachprüfung	Ascorbic acid	VC1242	2
Canea Pharma/Sanacorp	Ascorbic acid	VC1450	1
Gehe/Gehe	Ascorbic acid	L1505001	1
Caelo	Ascorbic acid	1234567	1
Zentiva/Alliance Health...	Ascorbic acid	15300007	1
Caelo	Ascorbic acid	15300007	4
Caelo	Ascorbic acid	15359003	1
Caelo	Ascorbic acid	16345205	1
NCPC	Ascorbic acid	1107411106	1
Caelo	Ascorbic acid	2061203	1
Euro OTC	Ascorbic acid	11121302	1
Caelo	Ascorbic acid	11208606	1
Caelo	Ascorbic acid	11208608	1
Caelo	Ascorbic acid	12272601/1	1
REWE Food Ingredients	Ascorbic acid	11572008237103	1
Caelo	Ascorbic acid	12350003	1
Caelo	Ascorbic acid	12349909	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caesar & Loretz GmbH	Ascorbic acid	11208606	1
Caelo	Ascorbic acid	12350005	2
Fagron	Ascorbic acid	12/25-N04	1
Premium Ingredients Int…	Ascorbic acid	2012444403	1
Euro OTC	Ascorbic acid	28081303	1
Gesundform	Ascorbic acid	L1110704	1
NE GPF	Ascorbic acid	DY0261121205	1
Euro OTC	Ascorbic acid	L1202011-02	1
Amos Vital	Ascorbic acid	L1120454	1
AmsVital GmbH	Ascorbic acid	L1220572	1
Caelo	Ascorbic acid	13341803/1	1
Wepa Paulus	Ascorbic acid	11406201	1
Caelo	Ascorbic acid	14044701/3	1
Caelo	Ascorbic acid	14214404	1
Euro OTC	Ascorbic acid	17011404	1
Caelo	Ascorbic acid	22101302	1
Apotheke Bauer & Cie. oHG	Ascorbic acid	23/09	1
Wepa	Ascorbic acid	261120415	1
Anzag/Gehe Balance	Ascorbic acid	L1210232	1
Amos Vital	Ascorbic acid	L1230216	2

- 77 083 spectra from 463 *Apo-Ident* customers from a total of 25 492 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Ascorbic acid* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ascorbic acid* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	200	0	72 233
Type B	0	440	0	161 633
Type C	0	74	2	77 083

The substance/substance group *Ascorbic acid* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 98.6364 %)
Type C	100.0000 % (> 99.8850 %)	97.3684 % (> 93.4211 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to

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exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21229	21229	0.00	60.12
21317	21229	3.12	59.89
22918	22918	0.00	61.80
23062	23062	0.00	60.34
23293	23293	0.00	59.26

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Ascorbyl palmitate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	21053-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Ascorbyl palmitate; Acidum palmitoylascorbinicum; Ascorbylis palmitas

Special notes

When selecting the *Ascorbyl palmitate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Ascorbyl palmitate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Ascorbyl palmitate	13K04-N01	21053	40	1403226
Fagron	Ascorbyl palmitate	13C06-B40-291206	21665	40	20140306
Fagron	Ascorbyl palmitate	15F01-B99-309774	21851	40	20150615
Fagron	Ascorbyl palmitate	17E18-B06-335527	23520	40	20170606
Fagron	Ascorbyl palmitate	17E18-B06-335527	23520SI	40	20170606

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 200 spectra of 5 reference samples from the substance/substance group *Ascorbyl palmitate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 4 different batches.

- 72 233 spectra from a total of 1578 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 200 spectra from 6 reference samples of the substance/substance group *Ascorbyl palmitate*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Ascorbyl palmitate	13C06-B40-291206	21665†	20
Fagron	Ascorbyl palmitate	15F01-B99-309774	21851†	20
Fagron	Ascorbyl palmitate	17H04-B01-338484	23987	40
Fagron	Ascorbyl palmitate	18A10-B03-344364	24098	40
Fagron	Ascorbyl palmitate	17H04-B01-338484	23987SI	40
Fagron	Ascorbyl palmitate	18A10-B03-344364	24098SI	40

- 161 873 spectra from a total of 3495 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B*

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 49 spectra from 22 *Apo-Ident* customers from 29 batches from the substance/substance group *Ascorbyl palmitate*.

- These include spectra of independent samples from 28 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Ascorbyl palmitate	16I30-B03-330625	1
Fagron	Ascorbyl palmitate	15f01-b99-309774	1
Bionorica	Ascorbyl palmitate	74736	1
Bionorica EthicsGmbH/Sa...	Ascorbyl palmitate	74736	1
Bionorica	Ascorbyl palmitate	74962	1
Bionorica/Noweda	Ascorbyl palmitate	77773	2
Bionorica Ethics7Noweda	Ascorbyl palmitate	82275	2
Bionorica Ethics/ Noweda	Ascorbyl palmitate	85532	2
Bionorica ethics	Ascorbyl palmitate	85532	2
Fagron	Ascorbyl palmitate	13C06-B40-291206	2
Fagron	Ascorbyl palmitate	14I03-N01	1
Fagron	Ascorbyl palmitate	15F01-B99	2
Fagron	Ascorbyl palmitate	15F01-B99-525121	3
Caelo	Ascorbyl palmitate	15F01-B99-525121	1
Fagron	Ascorbyl palmitate	15F01-B99-525122	3
Fagron	Ascorbyl palmitate	16/30-B03	1
Fagron	Ascorbyl palmitate	16/30-B03-329375	1
Caelo	Ascorbyl palmitate	16810-B04525199	1
Fagron	Ascorbyl palmitate	16B10-B04-525199	1
Caelo	Ascorbyl palmitate	16B10-B04324111	1
Caelo	Ascorbyl palmitate	16B10-B04-525199	1
Fagron	Ascorbyl palmitate	16I30-B03	1
Fagron	Ascorbyl palmitate	16I30-B03-326543	1
Caelo	Ascorbyl palmitate	16B-B04-525283	1
Fagron	Ascorbyl palmitate	16I30-B03-329375	1
Fagron	Ascorbyl palmitate	16I30-B03-525358	2
Fagron	Ascorbyl palmitate	16I30-B03-525380	2
Caelo	Ascorbyl palmitate	16l30-B03-525358	2
Fagron	Ascorbyl palmitate	17E18-B06	1
Caelo	Ascorbyl palmitate	17E18-B06-334914	1
Fagron	Ascorbyl palmitate	17H04-B01-338484	1
Bionorica	Ascorbyl palmitate	82275	1
Bionorica	Ascorbyl palmitate	85532	1
Fagron	Ascorbyl palmitate	K45532790	2
PHOENIX 30.06.2014	Ascorbyl palmitate	UQ21206229	1

- 77 110 spectra from 463 *Apo-Ident* customers from a total of 25 518 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Ascorbyl palmitate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ascorbyl palmitate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	200	0	72 233
Type B	0	200	0	161 873
Type C	0	48	1	77 110

The substance/substance group *Ascorbyl palmitate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 97.0000 %)
Type C	100.0000 % (> 99.8850 %)	97.9592 % (> 91.8367 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21053	21053	0.00	60.07
21665	21053	13.14	53.53
21851	21053	14.61	53.08
23520	21053	7.83	57.28

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Atropine sulfate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20653-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Atropine sulfate; Atropine sulphate; Atropini sulfas; Atropinum sulfuricum

Special notes

When selecting the *Atropine sulfate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Atropine sulfate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Atropine sulfate	11180602	20653	40	1405538
Caelo	Atropine sulfate	13173808	21088	40	1403483
Caelo	Atropine sulfate	13357405	21551	45	1504594
Caelo	Atropine sulfate	14336806	21719	40	1510209
Caelo	Atropine sulfate	15301601	21920	40	20150930
Caelo	Atropine sulfate	14336806	21719SI	40	1510209
Caelo	Atropine sulfate	15301601	21920SI	40	20150930

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 285 spectra of 7 reference samples from the substance/substance group *Atropine sulfate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 5 different batches.

- 72 148 spectra from a total of 1577 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 390 spectra from 12 reference samples of the substance/substance group *Atropine sulfate*.

- These include spectra of independent samples from 4 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Atropine sulfate	14336806	21719†	20
Caelo	Atropine sulfate	15301601	21920†	20
Fagron	Atropine sulfate	16G20-B06-328437	22932	40
Caelo	Atropine sulfate	16326802	22952	40
Caelo	Atropine sulfate	170264	23367	40
Caelo	Atropine sulfate	172732	23682	40
Caelo	Atropine sulfate	14336806	21719SI†	20
Caelo	Atropine sulfate	15301601	21920SI†	20
Fagron	Atropine sulfate	16G20-B06-328437	22932SI	40
Caelo	Atropine sulfate	16326802	22952SI	40
Caelo	Atropine sulfate	170264	23367SI	40
Caelo	Atropine sulfate	172732	23682SI	30

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 683 spectra from a total of 3493 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 12 spectra from 9 *Apo-Ident* customers from 10 batches from the substance/substance group *Atropine sulfate*.

- These include spectra of independent samples from 9 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Atropine sulfate	13357403	1
Caelo	Atropine sulfate	14336807	1
Caelo	Atropine sulfate	15115201	3
Caelo	Atropine sulfate	13357405	1
Gehe	Atropine sulfate	16326802	1
Noweda	Atropine sulfate	12250403	1
Caelo	Atropine sulfate	13173809	1
Phönix	Atropine sulfate	15301607	1
Caelo	Atropine sulfate	12244206	1
fargon	Atropine sulfate	13K01-N01	1

- 77 147 spectra from 463 *Apo-Ident* customers from a total of 25 537 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Atropine sulfate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Atropine sulfate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	285	0	72 148
Type B	0	390	0	161 683
Type C	0	12	0	77 147

The substance/substance group *Atropine sulfate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.8947 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 98.4615 %)
Type C	100.0000 % (> 99.8851 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20653	20653	0.00	33.59
21088	21088	0.00	33.56
21551	21551	0.00	32.05
21719	21719	0.00	29.43
21920	21719	12.23	30.03

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Bacitracin**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	`20851-2018-07-18`
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Bacitracin; Bacitracinum

Special notes

When selecting the *Bacitracin* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Bacitracin*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Bacitracin	`13A-03-N11`	20851	20	1401189
Fagron	Bacitracin	`14A21-B09-292909`	21657	40	1511741
Roth	Bacitracin	`194169081`	21658	40	20140508
Fagron	Bacitracin	`14E23-B03-296243`	21686	30	1503715
Fagron	Bacitracin	`15C12-B06-309185`	21898	40	20150324

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Bacitracin	15C12-B06-309185	21986	40	9466
Fagron	Bacitracin	16B17-B03-322939	22739	40	20160421
Fagron	Bacitracin	17L11-B02-343685	23933	40	1806068

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 290 spectra of 8 reference samples from the substance/substance group *Bacitracin*. These samples are listed above in the section *calibration samples*. The reference samples originate from 7 different batches.

- 72 143 spectra from a total of 1575 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 320 spectra from 10 reference samples of the substance/substance group *Bacitracin*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Bacitracin	09J30-N01	20218	40
Fagron	Bacitracin	13A-03-N11	20851†	20
Fagron	Bacitracin	14A21-B09-292909	21657†	20
Roth	Bacitracin	194169081	21658†	20
Fagron	Bacitracin	14E23-B03-296243	21686†	30
Fagron	Bacitracin	15C12-B06-309185	21898†	20
Fagron	Bacitracin	15C12-B06-309185	21986†	20
Fagron	Bacitracin	16I12-B03-334194	23531	30
Fagron	Bacitracin	14A21-B09-292909	21657SI	60
Fagron	Bacitracin	15C12-B06-309185	21898SI	60

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- 161 753 spectra from a total of 3492 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 69 spectra from 42 *Apo-Ident* customers from 39 batches from the substance/substance group *Bacitracin*.

- These include spectra of independent samples from 37 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Bacitracin	11/17-N01	1
Fagron	Bacitracin	13A03-N11	1
Fagron	Bacitracin	11J17-N01	2
Fagron	Bacitracin	12G12-N17	1
Fagron	Bacitracin	13D26-N08	1
Fagron	Bacitracin	13B25-B01	1
Fagron	Bacitracin	14A21-B09	2
Fagron	Bacitracin	14A21-B09-290643	2
Fagron	Bacitracin	11E23-N10	1
Fagron	Bacitracin	14A21-B09-290645	2
Fagron	Bacitracin	14A21-B09-292908	2
Caelo	Bacitracin	14A21-B09-292908	1
Fagron	Bacitracin	14E23-B03	3
Fagron	Bacitracin	14E23-B03-296243	9
Fagron	Bacitracin	14e23-b03-296243	1
Fagron	Bacitracin	14E23-B03-296245	2
Fagron	Bacitracin	14E23-B03-303424	2
Fagron	Bacitracin	14E23B03-303424	1
Fagraon	Bacitracin	14E23-B03-303424	1
Fagron	Bacitracin	14E23-B03-333424	1
Fagron	Bacitracin	15C12-B06	2
Caelo	Bacitracin	15C12-B06-317782	1
Fagron	Bacitracin	14E23-B03-303425	1
Fagron	Bacitracin	15C12-B06-309185	1
Fagron	Bacitracin	16B17-B03	3
Fagron	Bacitracin	15C12-B06-317782	2
Caelo	Bacitracin	15080605	1
Fargon/Phönix	Bacitracin	15C12-B06-312975	1
Caelo	Bacitracin	16B17-B03-322891	1
Fagron	Bacitracin	16B17-B03-322891	4
Fagron	Bacitracin	16b17-b03-322939	1
Fagron	Bacitracin	16I12-B03-334052	1
Fagron	Bacitracin	17L11-B02-343686	1
Fagron	Bacitracin	16I12-B03-335331	1
Fagron	Bacitracin	211531	1

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†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Supplier	Substance	Batch	Spectra
Fagron	Bacitracin	28051509	1
Fagron	Bacitracin	31071503	1
Fagron	Bacitracin	C2280017	3
Fagron	Bacitracin	C2280065	1
Phönix Gotha	Bacitracin	C2280010	1
Fagron	Bacitracin	13C13-N10	1
Fagron	Bacitracin	700193-0001	1
Phönix	Bacitracin	c2280065	1

- 77 090 spectra from 463 *Apo-Ident* customers from a total of 25 508 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Bacitracin* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Bacitracin* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	290	0	72 143
Type B	0	212	108	161 753
Type C	0	64	5	77 090

The substance/substance group *Bacitracin* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.9310 %)
Type B	100.0000 % (> 99.9928 %)	66.2500 % (> 65.3125 %)
Type C	100.0000 % (> 99.8850 %)	92.7536 % (> 88.4058 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

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Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20851	20851	0.00	24.68
21657	21657	0.00	24.87
21658	21986	3.92	26.67
21686	21686	0.00	26.13
21898	21986	4.27	26.00
21986	21986	0.00	25.41
22739	23933	5.72	26.77
23933	23933	0.00	26.92

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Beclometasone dipropionate, anhydrous**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	21046-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Beclometasone dipropionate, anhydrous; Beclometasoni dipropionas anhydricus; Beclometasonum dipropionicum anhydricum

Special notes

When selecting the *Beclometasone dipropionate, anhydrous* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Beclometasone dipropionate, anhydrous*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Beclometasone di…	13I05-N03	21046	40	1511689
Fagron	Beclometasone di…	13E02B40293328	21554	40	20140508
Euro OTC	Beclometasone di…	1203022-03	21634	25	1509281
Fagron	Beclometasone di…	13E02-B40-296353	21977	40	20140508

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Beclometasone di...	1502032	22989	40	20150327*
Fagron	Beclometasone di...	13E02-B40-296353	21977SI	20	20140508
Euro OTC	Beclometasone di...	1502032	22989SI	30	20150327*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 235 spectra of 7 reference samples from the substance/substance group *Beclometasone dipropionate, anhydrous*. These samples are listed above in the section *calibration samples*. The reference samples originate from 5 different batches.

- 72 198 spectra from a total of 1577 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 317 spectra from 10 reference samples of the substance/substance group *Beclometasone dipropionate, anhydrous*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Beclometasone dipropionate, ...	11C01-N03	20293	40
Euro OTC	Beclometasone dipropionate, ...	1203022-03	21634†	35
Fagron	Beclometasone dipropionate, ...	13E02-B40-296353	21977†	20
Euro OTC	Beclometasone dipropionate, ...	1203022-03	21995	60
Fagron	Beclometasone dipropionate, ...	15F29-B09-314376	23104	40

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*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Beclometasone dipropionate, ...	16B16-B03-342082	23930	40
Fagron	Beclometasone dipropionate, ...	13E02-B40-296353	21977SI†	9
Euro OTC	Beclometasone dipropionate, ...	1203022-03	21995SI	28
Fagron	Beclometasone dipropionate, ...	15F29-B09-314376	23104SI	20
Fagron	Beclometasone dipropionate, ...	16B16-B03-342082	23930SI	25

- 161 756 spectra from a total of 3494 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 41 spectra from 12 *Apo-Ident* customers from 24 batches from the substance/substance group *Beclometasone dipropionate, anhydrous*.

- These include spectra of independent samples from 21 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Euro OTC	Beclometasone dipropionate, ...	1203022-01	2
Fagron	Beclometasone dipropionate, ...	13/05-N03	1
Euro OTC	Beclometasone dipropionate, ...	1203022-03	1
Fagron	Beclometasone dipropionate, ...	13E02-B40	1
Fagron	Beclometasone dipropionate, ...	13/05-N03	1
Fagron	Beclometasone dipropionate, ...	13E02-B40-293327	4
Fagron	Beclometasone dipropionate, ...	13E02-B40-296354	2
Fagron	Beclometasone dipropionate, ...	13I05-N03	3
Fagron	Beclometasone dipropionate, ...	13E02-B40-296353	1
Fagron	Beclometasone dipropionate, ...	13E02-B40-293328	2
Fagron	Beclometasone dipropionate, ...	13I05N03	1
Fagron	Beclometasone dipropionate, ...	14D04-B04-302336	3
Fagron	Beclometasone dipropionate, ...	14D04-B04302336	1
Fagron	Beclometasone dipropionate, ...	C0783/112020	1
Fagron	Beclometasone dipropionate, ...	14D04-B04-302335	1
Fagron	Beclometasone dipropionate, ...	16B16-B03-322517	1
fragon	Beclometasone dipropionate, ...	700721-0004	1
Fagron	Beclometasone dipropionate, ...	11F28-N02	2
Fagron	Beclometasone dipropionate, ...	11L01-N03	1
Fagron	Beclometasone dipropionate, ...	12D12-N03	5
Euro OTC	Beclometasone dipropionate, ...	C0783111020	1
Fagron	Beclometasone dipropionate, ...	12G04-N11	3
Caelo	Beclometasone dipropionate, ...	12G04-n11	1
Caelo	Beclometasone dipropionate, ...	13E02-B40-293326	1

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

- 77 118 spectra from 463 *Apo-Ident* customers from a total of 25 523 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Beclometasone dipropionate, anhydrous* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Beclometasone dipropionate, anhydrous* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	235	0	72 198
Type B	0	317	0	161 756
Type C	0	40	1	77 118

The substance/substance group *Beclometasone dipropionate, anhydrous* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.4468 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 98.1073 %)
Type C	100.0000 % (> 99.8850 %)	97.5610 % (> 90.2439 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21046	21046	0.00	37.25
21554	21634	4.25	36.19
21634	21634	0.00	38.28
21977	22989	3.58	33.21
22989	22989	0.00	36.11

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Benzocaine**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20211-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Benzocaine; Aethylium paraaminobenzoicum; Benzocainum

Special notes

When selecting the *Benzocaine* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Benzocaine*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Benzocaine	12341904	20843	40	1411055
Caelo	Benzocaine	13213509	21563	40	1706017

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 80 spectra of 2 reference samples from the substance/substance group *Benzocaine*. These samples are listed above in the section *calibration samples*. The reference samples originate from 2 different batches.

- 72 353 spectra from a total of 1580 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 300 spectra from 8 reference samples of the substance/substance group *Benzocaine*.

- These include spectra of independent samples from 6 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Benzocaine	10K02-N01	20211	40
Fagron	Benzocaine	10K02-N01	20219	40
Fagron	Benzocaine	12E04-N06	21083	40
Caelo	Benzocaine	13213509	21563†	20
Caelo	Benzocaine	161740	22641	40
Fagron	Benzocaine	14G02-B01-306980	23569	40
Caelo	Benzocaine	172174	23628	40
Fagron	Benzocaine	16D13-B01-342411	23986	40

- 161 773 spectra from a total of 3492 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B*

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 160 spectra from 106 *Apo-Ident* customers from 74 batches from the substance/substance group *Benzocaine*.

- These include spectra of independent samples from 71 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Benzocaine	13213502	5
Fagron	Benzocaine	11K08-B40	4
Caelo	Benzocaine	2412M-01118	1
Caelo	Benzocaine	13213511	3
Caelo	Benzocaine	12115011	4
Caelo	Benzocaine	12341904	6
Fagron	Benzocaine	12H10-N06	4
Fagron	Benzocaine	400313	1
Caelo	Benzocaine	5021401	1
Caelo	Benzocaine	10072603	2
Caelo	Benzocaine	6031501	1
Fagron	Benzocaine	10K02-N01	1
Fagron	Benzocaine	11/22-N03	1
Caelo	Benzocaine	1012ben	1
Fagron	Benzocaine	104210-0001	1
Fagron	Benzocaine	11/22-N3	1
Caelo	Benzocaine	11127506	1
Caelo	Benzocaine	11127508	2
Caelo	Benzocaine	11305206	1
Fargon/Sana	Benzocaine	11K08-290049	1
Fagron	Benzocaine	11I22-N03	1
Fagron	Benzocaine	11K08B40290050	1
Fagron	Benzocaine	11K08-B40-291840	1
Fagron	Benzocaine	11k08-B40-291841	1
Fagron	Benzocaine	11K08-B40-291841	4
Fagron	Benzocaine	11k08-b40-291841	1
Caelo	Benzocaine	12115007	5
Caelo	Benzocaine	12115008	3
Phönix Gotha	Benzocaine	12115011	1
Fagron	Benzocaine	12E04-N06	10
Fagron	Benzocaine	12341904	1
Caelo	Benzocaine	12341906	1
Fargon	Benzocaine	12H10-N06	1
Caelo	Benzocaine	1313509	1
Sanacorp	Benzocaine	13213502	1
Phoenix	Benzocaine	12H10-N06	1
Sanacorp	Benzocaine	13213506	1
Caelo	Benzocaine	13213509	7
Caelo	Benzocaine	13213515	2
Caelo	Benzocaine	13213516	1
Caelo	Benzocaine	13213518	1
Anzag / Noweda	Benzocaine	1321351	1
Fagron	Benzocaine	13F06-N10	1
Phönix	Benzocaine	13F06-N10	1

continued on the next page

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Supplier	Substance	Batch	Spectra
Fagron	Benzocaine	13L06-B02	3
Fagron	Benzocaine	13L06-B02-294100	2
Caelo	Benzocaine	13L06-B02-294112	1
Fargron	Benzocaine	13L06-B02-294112	1
Fagron	Benzocaine	13L06-B02-294112	2
Fagron	Benzocaine	13106-B02-300494	1
Euro OTC	Benzocaine	13L06-B02-297505	1
Fagron	Benzocaine	13L06-B02-300494	2
Caelo	Benzocaine	14277502	4
Fagron	Benzocaine	13L06-B06-300481	1
Fagron	Benzocaine	13L06Bo2	1
Fagron	Benzocaine	14G02-B01-310324	5
Caelo	Benzocaine	15227302	5
Caelo	Benzocaine	1515I-01118	1
Caelo	Benzocaine	15227307	3
Fagron	Benzocaine	15227307	1
Caelo	Benzocaine	15227311	2
Caelo	Benzocaine	15227314	3
Caelo	Benzocaine	15227315	3
Fagron	Benzocaine	15C19-B04-322019	4
Caelo	Benzocaine	15227317	1
Fagron	Benzocaine	15C19-B04-308254	1
Fagron	Benzocaine	15C19-B04-316239	1
Caelo	Benzocaine	15C19-B04-322019	1
Caelo	Benzocaine	16174001	3
Caelo	Benzocaine	24081212	1
Fiebig	Benzocaine	18018801	1
AHD	Benzocaine	16174001	1
Caelo	Benzocaine	19031301	1
Caelo	Benzocaine	16174007	1
Caelo	Benzocaine	3784947	1
Fagron	Benzocaine	4413E-01118	1
Fagron	Benzocaine	BZ-27/1112	1
Caelo	Benzocaine	91062169	1
Caelo	Benzocaine		1
Fagron	Benzocaine	13L06-B02297505	1
ACM	Benzocaine	KNC1643J15	1
s.Prüfprotokoll	Benzocaine		1
Fagron	Benzocaine	BZ-08/11-12	1
Fagron	Benzocaine	14G02B01318318	1
Fagron	Benzocaine	15C19-B04	1

- 76 999 spectra from 463 *Apo-Ident* customers from a total of 25 476 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Benzocaine* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Benzocaine* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

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	False positive	True positive	False negative	True negative
Type A	0	80	0	72 353
Type B	0	179	121	161 773
Type C	0	124	36	76 999

The substance/substance group *Benzocaine* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9928 %)	59.6667 % (> 58.6667 %)
Type C	100.0000 % (> 99.8850 %)	77.5000 % (> 75.6250 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20843	20843	0.00	99.48
21563	21563	0.00	100.63

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Benzoic acid**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	`20041-2018-07-18`
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Benzoic acid; Acidum benzoicum

Special notes

When selecting the *Benzoic acid* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Benzoic acid*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Benzoic acid	`13391310`	21458	40	`20131216`
Caelo	Benzoic acid	`15084611`	23095	40	`20150318`
Caelo	Benzoic acid	`15084614`	23096	40	`1707644`

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Benzoic acid*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 173 spectra from 5 reference samples of the substance/substance group *Benzoic acid*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Benzoic acid	09B25-N03	20041	33
Caelo	Benzoic acid	13391310	21458†	20
Caelo	Benzoic acid	15084614	22664	40
Caelo	Benzoic acid	15084614	23726	40
Caelo	Benzoic acid	162701	24027	40

- 161 900 spectra from a total of 3495 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 25 spectra from 19 *Apo-Ident* customers from 14 batches from the substance/substance group *Benzoic acid*.

- These include spectra of independent samples from 13 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Benzoic acid	1339120	1
Caelo	Benzoic acid	13391320	1
Caelo	Benzoic acid	13391310	1
Caelo	Benzoic acid	15084603	3
Caelo	Benzoic acid	15084607	3
Gatt-Koller / Phoenix	Benzoic acid	2992/07131314	2
Caelo	Benzoic acid	15084701	1
Sanacorp	Benzoic acid	15084607	1
Caleo/Phoenix	Benzoic acid	15084607	1
ACM	Benzoic acid	KNC0558J15	1
ACM	Benzoic acid	KNC0396J17	1
Phönix	Benzoic acid	13074605	1
Caelo	Benzoic acid	13074610	2
Caelo	Benzoic acid	13074605	3
Caelo	Benzoic acid	10156104	1
Caelo	Benzoic acid	13391314	1
Caelo	Benzoic acid	90179109	1

- 77 134 spectra from 463 *Apo-Ident* customers from a total of 25 533 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Benzoic acid* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Benzoic acid* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	152	21	161 900
Type C	0	22	3	77 134

The substance/substance group *Benzoic acid* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	87.8613 % (> 86.1272 %)
Type C	100.0000 % (> 99.8850 %)	88.0000 % (> 76.0000 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21458	23096	10.56	51.98
23095	23096	10.07	53.10
23096	23096	0.00	58.06

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Benzydamine hydrochloride**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20624-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Benzydamine hydrochloride; Benzydamini hydrochloridum; Benzydaminum hydrochloricum

Special notes

When selecting the *Benzydamine hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Benzydamine hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Benzydamine hydr…	14I30-B04-300713	21699	30	AR-15-FG-015977-01
Fagron	Benzydamine hydr…	15I17-B02-315060	22268	40	20151211
Fagron	Benzydamine hydr…	16D05-B50-332333	23203	40	20170323

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 110 spectra of 3 reference samples from the substance/substance group *Benzydamine hydrochloride*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 323 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 155 spectra from 5 reference samples of the substance/substance group *Benzydamine hydrochloride*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Benzydamine hydrochloride	12D26-N14	20624	40
Fagron	Benzydamine hydrochloride	14I30-B04-300713	21699†	15
Fagron	Benzydamine hydrochloride	15I17-B02-315060	22268†	20
Fagron	Benzydamine hydrochloride	16D05-B50-332333	23204	40
Fagron	Benzydamine hydrochloride	17H01-B03-345050	23942	40

- 161 918 spectra from a total of 3494 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 21 spectra from 15 *Apo-Ident* customers from 20 batches from the substance/substance group *Benzydamine hydrochloride*.

- These include spectra of independent samples from 20 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Benzydamine hydrochloride	14B25-B01-294054	1
Fagron	Benzydamine hydrochloride	1503313P	1
Fagron	Benzydamine hydrochloride	12C20-N02	1
Fagron	Benzydamine hydrochloride	1503309P	1
Fagron	Benzydamine hydrochloride	15A14-B05	1
Fagron	Benzydamine hydrochloride	15A14-B05-303068	1
Fagron	Benzydamine hydrochloride	16B09-B05-318272	2
Caelo	Benzydamine hydrochloride	16B09-B05	1
Fagron	Benzydamine hydrochloride	15I17-B02	1
Fagron	Benzydamine hydrochloride	16D05-B50	1
Fagron	Benzydamine hydrochloride	16D05-b50-332334	1
Fagron	Benzydamine hydrochloride	16D05-B50-332334	1
Fagron	Benzydamine hydrochloride		1
Audor Pharma	Benzydamine hydrochloride	300111702007b	1
Audor Pharma	Benzydamine hydrochloride	AP300111702007B	1
Fagron	Benzydamine hydrochloride	12j10-n03	1
Fagron	Benzydamine hydrochloride	13H19N06	1
Fagron	Benzydamine hydrochloride	13A15-N03	1
FARGON	Benzydamine hydrochloride	13h19-n06	1
Fagron	Benzydamine hydrochloride	12K07-N16	1

- 77 138 spectra from 463 *Apo-Ident* customers from a total of 25 527 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Benzydamine hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Benzydamine hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	110	0	72 323
Type B	0	155	0	161 918
Type C	0	20	1	77 138

The substance/substance group *Benzydamine hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 94.5455 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 96.1290 %)
Type C	100.0000 % (> 99.8850 %)	95.2381 % (> 80.9524 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21699	21699	0.00	36.97
22268	21699	5.60	35.15
23203	21699	7.70	36.46

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Betaine monohydrate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20498-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Betaine monohydrate; Betainum monohydricum

Special notes

When selecting the *Betaine monohydrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Betaine monohydrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Betaine monohydr…	12336602	20991	40	1403327
Fagron	Betaine monohydr…	14I26-B06-309878	21956	40	20141212

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 80 spectra of 2 reference samples from the substance/substance group *Betaine monohydrate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 2 different batches.

- 72 353 spectra from a total of 1580 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 140 spectra from 4 reference samples of the substance/substance group *Betaine monohydrate*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Betaine monohydrate	11117715	20498	40
Fagron	Betaine monohydrate	14I26-B06-309878	21956†	20
Fagron	Betaine monohydrate	16H03-B04-330370	23092	40
Fagron	Betaine monohydrate	16H03-B04-330370	23378	40

- 161 933 spectra from a total of 3496 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 3 spectra from 2 *Apo-Ident* customers from 3 batches from the substance/substance group *Betaine monohydrate*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Betaine monohydrate	14A14-B02-292983	1
Fagron	Betaine monohydrate	16H03-B04-330370	1
Caelo	Betaine monohydrate	4312172831	1

- 77 156 spectra from 463 *Apo-Ident* customers from a total of 25 544 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Betaine monohydrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Betaine monohydrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	72 353
Type B	0	140	0	161 933
Type C	0	3	0	77 156

The substance/substance group *Betaine monohydrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 95.7143 %)
Type C	100.0000 % (> 99.8854 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20991	20991	0.00	50.88
21956	20991	2.75	51.80

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Betamethasone dipropionate, micronized**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20930-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Betamethasone dipropionate, micronized; Betamethasoni dipropionas micronisatum; Betamethasonum dipropionicum micronisatum

Special notes

When selecting the *Betamethasone dipropionate, micronized* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Betamethasone dipropionate, micronized*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Betamethasone di…	13I17-N05	20930	40	1401377
Caelo	Betamethasone di…	13372501	21250	40	AR-15-FG-005428-01
Caelo	Betamethasone di…	13236803	21366	40	20130730
Euro OTC	Betamethasone di…	1311023-01	21716	40	1505455

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Betamethasone di…	1601034	22372	30	20160204*
Fagron	Betamethasone di…	16C04-B03-324513	22898	40	20160421
Caelo	Betamethasone di…	13372501	21250SI	30	AR-15-FG-005428-01
Caelo	Betamethasone di…	13236803	21366SI	31	20130730
Euro OTC	Betamethasone di…	1311023-01	21716SI	30	1505455
Euro OTC	Betamethasone di…	1601034	22372SI	30	20160204*
Fagron	Betamethasone di…	16C04-B03-324513	22898SI	39	20160421

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 390 spectra of 11 reference samples from the substance/substance group *Betamethasone dipropionate, micronized*. These samples are listed above in the section *calibration samples*. The reference samples originate from 6 different batches.

- 72 043 spectra from a total of 1576 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 652 spectra from 20 reference samples of the substance/substance group *Betamethasone dipropionate, micronized*.

- These include spectra of independent samples from 6 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Betamethasone dipropionate, …	10K09-N06	20256	40

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*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Betamethasone dipropionate, ...	13I17-N05	20952	80
Caelo	Betamethasone dipropionate, ...	13236803	21367	35
Euro OTC	Betamethasone dipropionate, ...	1311023-01	21716†	20
Euro OTC	Betamethasone dipropionate, ...	1601034	22372†	15
Euro OTC	Betamethasone dipropionate, ...	1610014	22851	40
Caelo	Betamethasone dipropionate, ...	171059	23342	40
Euro OTC	Betamethasone dipropionate, ...	1705020	23539	40
Caelo	Betamethasone dipropionate, ...	173536	23839	40
Euro OTC	Betamethasone dipropionate, ...	1801045	24090	40
Caelo	Betamethasone dipropionate, ...	13372501	21250SI†	15
Caelo	Betamethasone dipropionate, ...	13236803	21366SI†	15
Caelo	Betamethasone dipropionate, ...	13236803	21367SI	60
Euro OTC	Betamethasone dipropionate, ...	1311023-01	21716SI†	16
Euro OTC	Betamethasone dipropionate, ...	1601034	22372SI†	15
Euro OTC	Betamethasone dipropionate, ...	1610014	22851SI	30
Caelo	Betamethasone dipropionate, ...	171059	23342SI	20
Euro OTC	Betamethasone dipropionate, ...	1705020	23539SI	27
Caelo	Betamethasone dipropionate, ...	173536	23839SI	25
Euro OTC	Betamethasone dipropionate, ...	1801045	24090SI	39

- 161 421 spectra from a total of 3488 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 380 spectra from 158 *Apo-Ident* customers from 104 batches from the substance/substance group *Betamethasone dipropionate, micronized*.

- These include spectra of independent samples from 98 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Betamethasone dipropionate, ...	8K03-N13	2
Caelo	Betamethasone dipropionate, ...	3170717	1
Fagron	Betamethasone dipropionate, ...	13/17-N05	11
	Betamethasone dipropionate, ...	13/17-N05	2
Fagron	Betamethasone dipropionate, ...	13/17-n05	1
Fischer/Gehe	Betamethasone dipropionate, ...	13/17-N05	2
Fargon/ Noweda	Betamethasone dipropionate, ...	13/17-N05	1
Euro OTC	Betamethasone dipropionate, ...	1303006-01	2
Caelo	Betamethasone dipropionate, ...	1303006-01	1
Euro OTC	Betamethasone dipropionate, ...	1305041-01	10
Euro OTC	Betamethasone dipropionate, ...	1311023-01	6
Euro OTC	Betamethasone dipropionate, ...	1311023-02	5

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†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Supplier	Substance	Batch	Spectra
Euro OTC	Betamethasone dipropionate, ...	131102301	1
Fagron	Betamethasone dipropionate, ...	1317-N05	1
Caelo	Betamethasone dipropionate, ...	13236801ok	1
Caelo	Betamethasone dipropionate, ...	13236802	6
Noweda	Betamethasone dipropionate, ...	13236803	1
Caelo	Betamethasone dipropionate, ...	13236801	7
Caelo	Betamethasone dipropionate, ...	13236803	1
Caelo	Betamethasone dipropionate, ...	13236805	5
Phoenix 03.04.20147	Betamethasone dipropionate, ...	13236805	1
Caelo	Betamethasone dipropionate, ...	13372501	8
Caelo	Betamethasone dipropionate, ...	13236806	4
Phoenix	Betamethasone dipropionate, ...	13236806	1
Euro OTC	Betamethasone dipropionate, ...	13372501	1
Caelo	Betamethasone dipropionate, ...	13372503	8
Caelo	Betamethasone dipropionate, ...	13372504	6
Caelo	Betamethasone dipropionate, ...	13372514	11
Caelo	Betamethasone dipropionate, ...	13372512	1
Caelo	Betamethasone dipropionate, ...	13372515	3
Caelo	Betamethasone dipropionate, ...	13372516	8
Caelo	Betamethasone dipropionate, ...	13372520	3
Fagron	Betamethasone dipropionate, ...	13I17-N05	12
Fagron	Betamethasone dipropionate, ...	13J16-B01-291844	1
Alliance health	Betamethasone dipropionate, ...	13I17-N05	1
Fagron	Betamethasone dipropionate, ...	13j16-B01-291844	1
Fagron	Betamethasone dipropionate, ...	13j16-b01-291845	1
Fagron	Betamethasone dipropionate, ...	13J16-B01-291845	2
Caelo	Betamethasone dipropionate, ...	140507	1
Fagron	Betamethasone dipropionate, ...	14C03-B03-296838	1
Fagron	Betamethasone dipropionate, ...	14C03-B06	2
Fagron	Betamethasone dipropionate, ...	14C03-B06-296837	5
Anzag/fagromn	Betamethasone dipropionate, ...	14C03-B06-296837	1
Caelo	Betamethasone dipropionate, ...	1503003-01	2
Euro OTC	Betamethasone dipropionate, ...	1503003-01	7
Euro OTC	Betamethasone dipropionate, ...	1503003-02	7
Euro/Sanacorp	Betamethasone dipropionate, ...	1503003-02	1
Caelo	Betamethasone dipropionate, ...	1503003-02	1
Euro OTC	Betamethasone dipropionate, ...	150300302	1
Euro OTC	Betamethasone dipropionate, ...	1506016-02	1
Caelo	Betamethasone dipropionate, ...	15163301	19
Caelo	Betamethasone dipropionate, ...	15163302	6
Caelo	Betamethasone dipropionate, ...	15163303	11
Caelo	Betamethasone dipropionate, ...	15163304	9
Caelo	Betamethasone dipropionate, ...	15163305	1
phönix	Betamethasone dipropionate, ...	15163304	1
Caelo	Betamethasone dipropionate, ...	15238701	12
Gehe	Betamethasone dipropionate, ...	15238701	1
Caelo	Betamethasone dipropionate, ...	15412906	6
Caelo	Betamethasone dipropionate, ...	15412901	1
Caelo	Betamethasone dipropionate, ...	15412905	1
Caelo	Betamethasone dipropionate, ...	15412907	3
Caelo	Betamethasone dipropionate, ...	15412909	1
Caelo	Betamethasone dipropionate, ...	15412910	3
Caelo	Betamethasone dipropionate, ...	15412914	1
Caelo	Betamethasone dipropionate, ...	15412916	1
Fagron	Betamethasone dipropionate, ...	15H28-B06-313088	1
Fagron	Betamethasone dipropionate, ...	15H25-B06-313088	1
Euro OTC	Betamethasone dipropionate, ...	160103401	1
Euro OTC	Betamethasone dipropionate, ...	1601034-01	21
Fagron	Betamethasone dipropionate, ...	1601034-01	1
Euro OTC	Betamethasone dipropionate, ...	1610014-01	15

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Supplier	Substance	Batch	Spectra
Fagron	Betamethasone dipropionate, ...	16C04-B03-320850	1
Fagron	Betamethasone dipropionate, ...	16C04-B03-320852	1
Caelo	Betamethasone dipropionate, ...	17105902	2
Caelo	Betamethasone dipropionate, ...	17105903	1
Caelo	Betamethasone dipropionate, ...	17B16-B04-332220	1
Fagron	Betamethasone dipropionate, ...	2109DM0	1
Fagron	Betamethasone dipropionate, ...	2109DM0B0011322	1
Caelo	Betamethasone dipropionate, ...	2109DM0B00111322	1
Caelo	Betamethasone dipropionate, ...	5163303	1
Sanacorp	Betamethasone dipropionate, ...		1
Euro OTC	Betamethasone dipropionate, ...	Co0044/1A15020	1
Fagron	Betamethasone dipropionate, ...	11K28-N10	4
Fagron	Betamethasone dipropionate, ...	11I02-N01	1
Phönix Gotha	Betamethasone dipropionate, ...	11/02-N01	1
Fagron	Betamethasone dipropionate, ...	9J05-N09	1
Fagron	Betamethasone dipropionate, ...	10E19-N03	1
Caelo	Betamethasone dipropionate, ...		1
Fagron	Betamethasone dipropionate, ...	11D26-N06	2
Caelo	Betamethasone dipropionate, ...	1210020-01	1
Euro OTC	Betamethasone dipropionate, ...	121002001	1
Phönix 05.12.12	Betamethasone dipropionate, ...	12114505	1
Caelo	Betamethasone dipropionate, ...	12114506	1
Caelo	Betamethasone dipropionate, ...	12114501	1
Caelo	Betamethasone dipropionate, ...	12114507	3
Noweda	Betamethasone dipropionate, ...	12114509	1
Caesar/Lorenz	Betamethasone dipropionate, ...	12114509	1
Fagron	Betamethasone dipropionate, ...	12827-N08	1
Caelo	Betamethasone dipropionate, ...	12114513	3
Bombastus	Betamethasone dipropionate, ...	12B27N08	1
Caelo	Betamethasone dipropionate, ...	12114511	2
Caelo	Betamethasone dipropionate, ...	12114512	1
Fagron	Betamethasone dipropionate, ...	12B27-N08	4
Fagron	Betamethasone dipropionate, ...	12C21-N13	1
Alliance Health 24.01.2...	Betamethasone dipropionate, ...	13/17-N05	1
Caelo	Betamethasone dipropionate, ...	13023001	3
Caelo	Betamethasone dipropionate, ...	13023002	6
Fagron	Betamethasone dipropionate, ...	13023004	1
Caelo	Betamethasone dipropionate, ...	13023005	9
Euro OTC	Betamethasone dipropionate, ...	1303006/01	1
Euro OTC	Betamethasone dipropionate, ...	1303006-02	1
Hirsch	Betamethasone dipropionate, ...	1303006-01	1
Phönix	Betamethasone dipropionate, ...	1303006-02	1
Fagron	Betamethasone dipropionate, ...	1303006-02	1
Euro OTC	Betamethasone dipropionate, ...	1305041-02	3
Caelo	Betamethasone dipropionate, ...	13125701	3
Cealo/Sanacorp	Betamethasone dipropionate, ...	13125701	1
Euro OTC	Betamethasone dipropionate, ...	13125702	1
Caelo	Betamethasone dipropionate, ...	13125703	4
Fagron	Betamethasone dipropionate, ...		1
Noweda	Betamethasone dipropionate, ...	13236802	1
Caelo	Betamethasone dipropionate, ...	1325702	1
Caelo	Betamethasone dipropionate, ...	2313A-03644	1
Caelo	Betamethasone dipropionate, ...	18121306	1
Caelo	Betamethasone dipropionate, ...	AKD11	1
EUro/AHD	Betamethasone dipropionate, ...	1303006-01	3
Euro OTC	Betamethasone dipropionate, ...	130541-01	1

- 76 779 spectra from 463 *Apo-Ident* customers from a total of 25 446 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Betamethasone dipropionate, micronized* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Betamethasone dipropionate, micronized* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	390	0	72 043
Type B	0	652	0	161 421
Type C	0	377	3	76 779

The substance/substance group *Betamethasone dipropionate, micronized* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9887 %)	100.0000 % (> 98.4615 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 99.0798 %)
Type C	100.0000 % (> 99.8849 %)	99.2105 % (> 98.4211 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20930	20930	0.00	11.64
21250	21250	0.00	10.94
21366	22372	5.84	14.89
21716	21716	0.00	8.96
22372	22372	0.00	11.85
22898	20930	5.24	12.97

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Betamethasone valerate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20026-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Betamethasone valerate; Betamethasoni valeras; Betamethasonum valerianicum

Special notes

When selecting the *Betamethasone valerate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Betamethasone valerate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Betamethasone va…	12K07-N23	20887	39	20121119
Euro OTC	Betamethasone va…	1208014-01	20920	40	20120928
Caelo	Betamethasone va…	13091213	21215	40	20130506
Fagron	Betamethasone va…	13K29-B32-288243	21566	40	20131210
Caelo	Betamethasone va…	13225507	21588	34	1706018

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Betamethasone va...	1406019-01	21645	40	20140725
Fagron	Betamethasone va...	13K05-B08-292651	21674	40	1511154
Euro OTC	Betamethasone va...	1510037	22249	40	20151215*
Euro OTC	Betamethasone va...	1610010	22861	40	20161116*
Euro OTC	Betamethasone va...	1510037	22249SI	20	20151215*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 373 spectra of 10 reference samples from the substance/substance group *Betamethasone valerate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 9 different batches.

- 72 060 spectra from a total of 1573 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 509 spectra from 18 reference samples of the substance/substance group *Betamethasone valerate*.

- These include spectra of independent samples from 6 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Betamethasone valerate	82806109	20026	30
Fagron	Betamethasone valerate	13K29-B32-288243	21566†	20
Caelo	Betamethasone valerate	13225507	21588†	26

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*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Betamethasone valerate	1406019-01	21645†	20
Fagron	Betamethasone valerate	13K05-B08-292651	21674†	20
Euro OTC	Betamethasone valerate	1510037	22249†	20
Euro OTC	Betamethasone valerate	1606023	22716	40
Caelo	Betamethasone valerate	170787	23332	40
Euro OTC	Betamethasone valerate	1704019	23396	40
Caelo	Betamethasone valerate	172716	23683	30
Euro OTC	Betamethasone valerate	1801024	23967	40
Euro OTC	Betamethasone valerate	1510037	22249SI†	10
Euro OTC	Betamethasone valerate	1606023	22716SI	34
Euro OTC	Betamethasone valerate	1610010	22861SI	30
Caelo	Betamethasone valerate	170787	23332SI	20
Euro OTC	Betamethasone valerate	1704019	23396SI	29
Caelo	Betamethasone valerate	172716	23683SI	20
Euro OTC	Betamethasone valerate	1801024	23967SI	40

- 161 564 spectra from a total of 3487 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 1462 spectra from 353 *Apo-Ident* customers from 327 batches from the substance/substance group *Betamethasone valerate*.

- These include spectra of independent samples from 322 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Betamethasone valerate	12003403	10
Fagron	Betamethasone valerate	11E18-N03	4
Caelo	Betamethasone valerate	10296707	1
Caelo	Betamethasone valerate	10106313	1
Euro OTC	Betamethasone valerate	1208014-01	18
Caelo	Betamethasone valerate	8081502	1
Euro OTC	Betamethasone valerate	1208014-03	6
Caesar & Loretz GmbH Hi…	Betamethasone valerate	120801402	1
Euro OTC	Betamethasone valerate	1208014-04	8
Caelo	Betamethasone valerate	12229808	12
Fagron	Betamethasone valerate	12K07N23	1
Fagron	Betamethasone valerate	12K07-N23	8
Symbotica Spec/Noweda	Betamethasone valerate	1208014-04	1
Caelo	Betamethasone valerate	123345	1
Fagron	Betamethasone valerate	12L11-N01	19
Fagron	Betamethasone valerate	13/17-B08-292649	2

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†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Supplier	Substance	Batch	Spectra
Fagron	Betamethasone valerate	12L11-NO1	2
Caelo	Betamethasone valerate	13012015C	1
Caelo	Betamethasone valerate	13091203	16
Caelo	Betamethasone valerate	13091205	12
AHD 17.11.14 EK 18,11	Betamethasone valerate	13091205	1
Noweda	Betamethasone valerate	13091205	1
Caelo	Betamethasone valerate	13091209	6
Phönix	Betamethasone valerate	13091209	2
Caelo	Betamethasone valerate	13091206	2
Caelo	Betamethasone valerate	13091207	9
Caelo	Betamethasone valerate	13091210	4
Gehe 13.02.14	Betamethasone valerate	13091210	3
Caelo	Betamethasone valerate	13091211	5
Caelo	Betamethasone valerate	13091212	10
Caelo	Betamethasone valerate	13091213	8
Phönix Gotha	Betamethasone valerate	13091213	1
Euro OTC	Betamethasone valerate	1311039	1
Euro OTC	Betamethasone valerate	1311039-01	25
Euro OTC	Betamethasone valerate	131103901	1
Noveda	Betamethasone valerate	1311039-01	1
Fagron	Betamethasone valerate	1311039-01	1
NEWCHEM	Betamethasone valerate	1311039-01	1
Caelo	Betamethasone valerate	13225502	3
Euro OTC	Betamethasone valerate	131139-01	1
Caelo	Betamethasone valerate	13225503	8
GEHE 17.06.2014	Betamethasone valerate	13225503	1
Caelo	Betamethasone valerate	13225504	11
Caesar & Loretz GmbH	Betamethasone valerate	13225504	1
Caelo	Betamethasone valerate	13225505	8
Caelo	Betamethasone valerate	13225507	2
Caelo	Betamethasone valerate	13225508	11
Phoenix Goettin	Betamethasone valerate	13225508	1
Caelo	Betamethasone valerate	13225509	2
Hustadt Apotheke	Betamethasone valerate	13225508	1
Caelo	Betamethasone valerate	13225515	10
Caelo	Betamethasone valerate	13225516	10
AHDE / Cael 17.02.2015	Betamethasone valerate	13225516	1
Caelo	Betamethasone valerate	13225607	1
Fagron	Betamethasone valerate	13D03-N07	47
Fagron	Betamethasone valerate	13G19-N01	48
Fargon/Anzag	Betamethasone valerate	13G19-N01	1
Caelo	Betamethasone valerate	13G19-N01	6
Herbasinica	Betamethasone valerate	13g19-n01	1
Fargon/Alliance HC	Betamethasone valerate	13G19-N01	2
Fagron	Betamethasone valerate	13g19-n01	2
Hirsch	Betamethasone valerate	13G19-No1	1
Fagron	Betamethasone valerate	13K05-B08	4
Fagron	Betamethasone valerate	13K05-B08-292647	3
Fagron	Betamethasone valerate	13K29-B12-288247	1
Fagron	Betamethasone valerate	13K05-B08-092652	1
Fagron	Betamethasone valerate	13K29-B23-288246	1
Fagron	Betamethasone valerate	13K29-B32	7
Fagron	Betamethasone valerate	13K05-B08-292652	1
Fagron	Betamethasone valerate	13K05-B08-291663	1
Fagron	Betamethasone valerate	13K29-B32-28824	1
Fagron	Betamethasone valerate	13K29-B32-288246	4
Fagron	Betamethasone valerate	13K29-B32-288244	2
Fagron	Betamethasone valerate	13K29-B32-288245	1
Fagron	Betamethasone valerate	13K29B32288243	1
Fagron	Betamethasone valerate	13K29-B32-288247	16

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Supplier	Substance	Batch	Spectra
Ichthyol-Gesellschaft	Betamethasone valerate	13k29-B32-288247	1
Fargon/Alliance HC	Betamethasone valerate	13K29-B32-288247	1
Caelo	Betamethasone valerate	13K29B32288247	1
Caelo	Betamethasone valerate	13K29-B32-288247	1
Fagron	Betamethasone valerate	13K29-B32-288248	3
Fagron	Betamethasone valerate	13k29b32288247	1
Fagron	Betamethasone valerate	13K29-B32-288250	3
Fargon	Betamethasone valerate	13k29-b32-289364	1
Fagron	Betamethasone valerate	13117-B08-292649	2
Euro OTC	Betamethasone valerate	13K29-B32-289364	1
Caelo	Betamethasone valerate	14031407	1
Euro OTC	Betamethasone valerate	1406019-01	28
Caelo	Betamethasone valerate	1406019-01	1
Symbiotica Spec.	Betamethasone valerate	1406019-01	3
Euro OTC	Betamethasone valerate	1406011903	1
Euro OTC	Betamethasone valerate	140601901	1
noweda	Betamethasone valerate	1406019-01	1
Euro OTC	Betamethasone valerate	1406019-02	24
AHD	Betamethasone valerate	1406019-02	2
Euro OTC	Betamethasone valerate	140601902	1
Caelo	Betamethasone valerate	1406019-02	2
EuRho	Betamethasone valerate	1406019-02	1
Euro OTC	Betamethasone valerate	1406019-03	30
Euro OTC	Betamethasone valerate	140601903	2
Caelo	Betamethasone valerate	1406019-03	2
Euroo	Betamethasone valerate	1406019-03	1
Caelo	Betamethasone valerate	140601903	1
Noweda	Betamethasone valerate	1406019-03	2
Fagron	Betamethasone valerate	1406019-03	1
Caelo	Betamethasone valerate	14188602	4
Caelo	Betamethasone valerate	14188603	7
Sanacorp	Betamethasone valerate	14188602	1
Caelo	Betamethasone valerate	14188604	8
Fagron	Betamethasone valerate	14188603	1
Caelo	Betamethasone valerate	14188605	1
caesar&loretz,phönix	Betamethasone valerate	14188606	1
Caelo	Betamethasone valerate	14188608	6
Noweda/Ceasar Lorenz	Betamethasone valerate	14188606	1
Phönix Gotha	Betamethasone valerate	14188608	1
Caelo	Betamethasone valerate	14188609	3
Caelo	Betamethasone valerate	14188610	5
Caelo	Betamethasone valerate	14188617	3
Caelo	Betamethasone valerate	1488610	1
Caelo	Betamethasone valerate	14188619	3
Alliance Healthcare	Betamethasone valerate	146019-02	1
Fagron	Betamethasone valerate	14C19-B02	3
Fagron	Betamethasone valerate	14C19-B02-292648	1
Fagron	Betamethasone valerate	14C19-B02-292646	1
Fagron	Betamethasone valerate	14C19-B02-292650	7
Fagron	Betamethasone valerate	14C19B02	1
Fagron	Betamethasone valerate	14c19-b02-292650	1
Fagron	Betamethasone valerate	14C19-B02-292653	6
Fagron	Betamethasone valerate	14C19-B02-2926550	1
Caelo	Betamethasone valerate	14C19-B02-292653	1
Fagron	Betamethasone valerate	14C19-B02-296168	4
Fagron	Betamethasone valerate	14C19-B02-296169	2
Fagron	Betamethasone valerate	14G30-B05	7
Caelo	Betamethasone valerate	14G30-B05	1
Fagron	Betamethasone valerate	14G30B05296172	1
Fagron	Betamethasone valerate	14G30-B05-296172	4

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Supplier	Substance	Batch	Spectra
Fagron	Betamethasone valerate	14G30-B05-296173	9
Fagron	Betamethasone valerate	14G30-B05-296175	1
Fagron	Betamethasone valerate	14G30-B05-309520	6
Fagron	Betamethasone valerate	14G30B05309519	1
Fagron	Betamethasone valerate	14G30-B05-309518	1
Gehe	Betamethasone valerate	14H25-B01-302863	1
Fagron	Betamethasone valerate	14G30-B05-309521	1
Fagron	Betamethasone valerate	14H28-B01	3
Fagron	Betamethasone valerate	14H28-B01-302683	1
Fagron	Betamethasone valerate	14H28B01	1
Gehe	Betamethasone valerate	14H28-B01-302863	1
Fagron	Betamethasone valerate	14H28-B01-302863	3
Noweda	Betamethasone valerate	14H28B01302863	1
Fagron	Betamethasone valerate	14H28-B01-302864	4
Cael Sanacorp 05.02.2016	Betamethasone valerate	14H28-B01-302864	1
Fagron	Betamethasone valerate	14H28B01302864	1
Fagron	Betamethasone valerate	14H28-B01-302865	13
Caelo	Betamethasone valerate	14H28-B01-302865	1
Fagron	Betamethasone valerate	14h28-b01-302865	2
Fagron	Betamethasone valerate	14H28-B01-302866	3
Fagron	Betamethasone valerate	14H28-b01-302866	1
Fargon,VDL;4.1.15; 106,74	Betamethasone valerate	14H28-B01-302866	1
Hedinger	Betamethasone valerate	14H28-B01-302877	1
Fagron	Betamethasone valerate	14H28-B01-302877	2
Fagron	Betamethasone valerate	14H28-B01-305470	1
phönix	Betamethasone valerate	15/16B07-319228	1
AHD/Fargon	Betamethasone valerate	14H28-Bo1-302865	1
Fagron	Betamethasone valerate	15/16-B07	1
Fagron	Betamethasone valerate	15/16-B07317428	1
Fagron	Betamethasone valerate	15/16-B07-317416	2
Ebert u. Jacobi 16.0...	Betamethasone valerate	15/16-B07-317417	1
Fagron	Betamethasone valerate	15/16-B07-317417	2
Fagron	Betamethasone valerate	15/16-B07-317428	1
Fagron	Betamethasone valerate	15/16-B07-319228	3
Caelo	Betamethasone valerate	15/16-B07-319228	2
Fagron	Betamethasone valerate	15/16-B07-319832	1
Caelo	Betamethasone valerate	15075802	20
Allianz Healthcare 27.0...	Betamethasone valerate	15075802	1
Fagron	Betamethasone valerate	15075802	1
Caesar&Loretz GmbH/Anzag	Betamethasone valerate	15075802	1
Caelo	Betamethasone valerate	15075803	6
Caello/Sanacorp	Betamethasone valerate	15075803	1
Caelo	Betamethasone valerate	15075804	9
Caelo	Betamethasone valerate	150758036	1
Caesar und Loretz	Betamethasone valerate	15075803	1
Caelo	Betamethasone valerate	15075805	5
Caelo	Betamethasone valerate	15075809	2
Caelo	Betamethasone valerate	15075810	7
Noweda	Betamethasone valerate	15075812	1
Caelo	Betamethasone valerate	15075812	4
Caelo	Betamethasone valerate	15075811	1
Euro OTC	Betamethasone valerate	1510037-01	15
Bombastus	Betamethasone valerate	1510037-01	1
Caelo	Betamethasone valerate	1510037-01	2
Euro/Alliance Healthcare	Betamethasone valerate	1510037-01	1
Fagron	Betamethasone valerate	15116-B07	1
Fagron	Betamethasone valerate	1516-B07-317416	1
Fagron	Betamethasone valerate	1516-B07-317417	1
Caelo	Betamethasone valerate	1516-B07-319228	1
Caleo/Phönix	Betamethasone valerate	1522609	1

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Supplier	Substance	Batch	Spectra
Caelo	Betamethasone valerate	15262602	3
Caelo	Betamethasone valerate	15262603	11
Caelo	Betamethasone valerate	15262604	9
Caelo	Betamethasone valerate	15262606	2
Caelo	Betamethasone valerate	15262607	6
Caelo	Betamethasone valerate	15262609	2
Caelo	Betamethasone valerate	15262610	3
Caelo	Betamethasone valerate	15398501	11
Caelo	Betamethasone valerate	15262612	1
Euro OTC	Betamethasone valerate	15398501	1
Caelo	Betamethasone valerate	15398503	2
Gehe	Betamethasone valerate	15398501	1
Caelo	Betamethasone valerate	15398505	6
Caelo	Betamethasone valerate	15398504	1
AHD 15.06.16 EK:18,44	Betamethasone valerate	15398505	1
Caelo	Betamethasone valerate	15398506	15
Caelo	Betamethasone valerate	15398510	1
Caelo	Betamethasone valerate	15398512	7
Caelo	Betamethasone valerate	15398514	1
Caelo	Betamethasone valerate	15398515	11
phönix	Betamethasone valerate	15398515	1
Fagron	Betamethasone valerate	15824-B04	1
Fagron	Betamethasone valerate	15B24-B04-307015	3
Fagron	Betamethasone valerate	15B24-B04	2
Caelo	Betamethasone valerate	15B24-B04	1
Fagron	Betamethasone valerate	15B24-B04-307016	11
Caelo	Betamethasone valerate	15B24-B04-307016	1
Fagron	Betamethasone valerate	15F16-B04	3
Fagron	Betamethasone valerate	15f16-b04314054	1
Fagron	Betamethasone valerate	15F16-B04-314054	2
Fagron	Betamethasone valerate	15F16-B04-314882	1
Caelo	Betamethasone valerate	15F16-B04-314055	2
Fagron	Betamethasone valerate	15F16-B04-315328	3
Fagron	Betamethasone valerate	15I16-B07	1
Fagron	Betamethasone valerate	15I16-B07-319228	1
Fagron	Betamethasone valerate	15I16-B07-319832	3
Fagron	Betamethasone valerate	15I16-B07-317416	1
Fagron	Betamethasone valerate	15I16-B07-317417	2
Fagron	Betamethasone valerate	15I16-Bo7-319832	1
Caelo	Betamethasone valerate	15L21-B03-318663	1
Euro OTC	Betamethasone valerate	1606023-01	18
Symbiotica/ Anzag	Betamethasone valerate	1606023-01	2
Caelo	Betamethasone valerate	1610010-01	4
Euro OTC	Betamethasone valerate	1610010-01	17
Caelo	Betamethasone valerate	16270501	6
Caelo	Betamethasone valerate	16270502	12
Caelo	Betamethasone valerate	16270505	3
Caelo	Betamethasone valerate	16270504	1
Caelo	Betamethasone valerate	16270503	3
Gehe	Betamethasone valerate	16270505	1
Cealo/Noweda	Betamethasone valerate	16270509	2
Caelo	Betamethasone valerate	16270509	3
Caesar&Loretz GmbH,PHön...	Betamethasone valerate	16270509	1
Caelo	Betamethasone valerate	16270511	4
Caelo	Betamethasone valerate	1627051	1
Fagron	Betamethasone valerate	16270513	1
Caelo	Betamethasone valerate	16270513	2
Caelo	Betamethasone valerate	16720513	1
Fagron	Betamethasone valerate	16B18-B02	1
Fargon/Anzag	Betamethasone valerate	16B18-B02-320971	1

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Supplier	Substance	Batch	Spectra
Fagron	Betamethasone valerate	16B18-B02-320971	3
Caelo	Betamethasone valerate	16B18-B02-320971	1
Fagron	Betamethasone valerate	16B18B02320971	1
Fagron	Betamethasone valerate	16B18-B02-322111	1
Fagron	Betamethasone valerate	16B18-B02320971	1
Fargon/Alliance HC	Betamethasone valerate	16B18-B02-322111	1
Caelo	Betamethasone valerate	16B18-B02-322121	2
Fagron	Betamethasone valerate	16B18-B02-322109	1
Fagron	Betamethasone valerate	16B18-B02-323033	2
Fagron	Betamethasone valerate	16B18-B02-323034	4
Fagron	Betamethasone valerate	16b18-b02-324798	1
Fagron	Betamethasone valerate	16E23-B03-324799	3
Caelo	Betamethasone valerate	16E23-B03	1
Fagron	Betamethasone valerate	16E23-B03-324800	3
Caelo	Betamethasone valerate	16E23-B03-324799	1
Caelo	Betamethasone valerate	16E23-B03-324800	1
Fagron	Betamethasone valerate	16E23-B03-328128	4
Fagron	Betamethasone valerate	16E23-B03-327354	1
phönix	Betamethasone valerate	16e23-b03-327350	1
Fagron	Betamethasone valerate	16E23B03328128	1
Fagron	Betamethasone valerate	16H22-B06	2
Fagron	Betamethasone valerate	16H22-B06-330523	1
Fagron	Betamethasone valerate	16H22-B06329223	1
Gehe/Fragon	Betamethasone valerate	16H22B06330524	2
Fagron	Betamethasone valerate	16h22-b06-330523	2
Euro OTC	Betamethasone valerate	1704019-01	11
Fagron	Betamethasone valerate	16H22-B06-330524	1
EuRho / Phoenix	Betamethasone valerate	1704019-01	1
Caelo	Betamethasone valerate	17078703	2
Caelo	Betamethasone valerate	17078704	2
Caesar & Loretz GmbH	Betamethasone valerate	17078701	1
Caelo	Betamethasone valerate	17078701	1
Caelo	Betamethasone valerate	17078715	1
Caelo	Betamethasone valerate	17078705	1
Caelo	Betamethasone valerate	1708701	1
Caelo	Betamethasone valerate	17078719	1
Gehe	Betamethasone valerate	1712E-01181	1
Fagron	Betamethasone valerate	17C29-335654	1
Fagron	Betamethasone valerate	17C29-B04-334329	1
Fagron	Betamethasone valerate	17c29-b04-335654	1
Fagron	Betamethasone valerate	17C29-B04-335657	1
Fagron	Betamethasone valerate	17C29-B04-335676	1
Euro OTC	Betamethasone valerate	2014Q1181	1
Caelo	Betamethasone valerate	18071403	1
Fagron	Betamethasone valerate	2186	1
Fagron	Betamethasone valerate	292652	1
Fagron	Betamethasone valerate	700103-0004	1
Fagron	Betamethasone valerate	BV019/0514	1
Fagron	Betamethasone valerate	BV036/1215	1
Fagron	Betamethasone valerate	BV-BLT225/0514	1
Caelo	Betamethasone valerate	BV-BLT225/0514	1
Fragron	Betamethasone valerate	BV-BLT225/0514	2
Beiersdorf direkt	Betamethasone valerate	C0073/115040	3
Caelo	Betamethasone valerate	C0073/1	3
Galderma/ Noweda	Betamethasone valerate	C0023/115040	1
Oberlinden Apotheke	Betamethasone valerate	c073/115040	1
Sanacorp	Betamethasone valerate		1
Caelo	Betamethasone valerate	NT0597M	1
Fagron	Betamethasone valerate	NT059M	1
Fagron	Betamethasone valerate	NT0597M	2

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Supplier	Substance	Batch	Spectra
Fagron	Betamethasone valerate	612211181	1
Caelo	Betamethasone valerate	10296701	1
Caelo	Betamethasone valerate	10296705	2
Euro OTC	Betamethasone valerate	1108045-01	3
Euro/Gehe	Betamethasone valerate	1108045-02	1
Kehr	Betamethasone valerate	1108045-03	1
Euro OTC	Betamethasone valerate	110804-02	1
Caelo	Betamethasone valerate	1108045-03	6
Euro OTC	Betamethasone valerate	1108045-03	8
Noweda	Betamethasone valerate	11131902	1
Caelo	Betamethasone valerate	11131905	1
Caelo	Betamethasone valerate	11131906	2
Caelo	Betamethasone valerate	11131909	1
Caelo	Betamethasone valerate	1113	1
Caesar & Loretz GmbH, 4...	Betamethasone valerate	11131914	3
Caelo	Betamethasone valerate	11131917	4
Caelo	Betamethasone valerate	11131914	2
Fagron	Betamethasone valerate	11K18-N09	4
Caelo	Betamethasone valerate	1131914	1
Caesar &Loretz GmbH	Betamethasone valerate	11131917	1
Noweda	Betamethasone valerate	11K18-N09	1
Gehe	Betamethasone valerate	12003403	2
Caesar/Lorenz	Betamethasone valerate	12003403	1
Phönix Gotha	Betamethasone valerate	12003403	1
Caesar & Loretz GmbH, 4...	Betamethasone valerate	12003404	1
Caelo	Betamethasone valerate	12003404	4
Caelo	Betamethasone valerate	12003405	8
Phönix Gotha	Betamethasone valerate	12003405	1
Anzag 24.10.12	Betamethasone valerate	12003405	1
Caelo	Betamethasone valerate	12003406	8
Phoenix	Betamethasone valerate	12003409	2
Caesar & Loretz GmbH, 4...	Betamethasone valerate	12003409	2
Caelo	Betamethasone valerate	12003409	2
Gehe	Betamethasone valerate	12003409	1
Caelo	Betamethasone valerate	12003407	1
Caelo	Betamethasone valerate	12003410	2
Caelo	Betamethasone valerate	12003411	4
vdl	Betamethasone valerate	12003411	1
Kehr	Betamethasone valerate	1208014-01	1
Caelo	Betamethasone valerate	120801401	1
Euro OTC	Betamethasone valerate	120801401	1
Noweda	Betamethasone valerate	1208014-02	2
GEHE	Betamethasone valerate	1208014-02	1
Euro OTC	Betamethasone valerate	1208014-02	13
Euro OTC	Betamethasone valerate	120801402	2
Symbiotica Spec.	Betamethasone valerate	1208014-04	1
Fagron	Betamethasone valerate	120801402	1
Euro OTC	Betamethasone valerate	120801404	1
Caelo	Betamethasone valerate	12229802	5
Euro OTC	Betamethasone valerate	120812-02	1
Caelo	Betamethasone valerate	12229804	5
Gehe	Betamethasone valerate	12229804	1
Caelo	Betamethasone valerate	12229805	10
Caelo	Betamethasone valerate	12229806	7
Phönix	Betamethasone valerate	12229807	1
Ph.Eur.7,0	Betamethasone valerate	12229808	1
Phönix Gotha	Betamethasone valerate	12229808	1
Caelo	Betamethasone valerate	12229809	2
Caesar & Loretz GmbH, 4...	Betamethasone valerate	12229809	1
Gehe	Betamethasone valerate	12229809	1

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Supplier	Substance	Batch	Spectra
Caelo	Betamethasone valerate	12229810	3
Caelo	Betamethasone valerate	12229811	7
Caelo	Betamethasone valerate	12229812	13
GEHE	Betamethasone valerate	12229813	1
Noweda	Betamethasone valerate	12229832	1
Caelo	Betamethasone valerate	12229813	2
Noweda	Betamethasone valerate	12B28-N01	2
Fagron	Betamethasone valerate	12B28-N01	10
Großhandel	Betamethasone valerate	12B028-N01	1
phönix, 12.12.12	Betamethasone valerate	12B28-N01	4
Fagron	Betamethasone valerate	12G09-N07	26
FARGON	Betamethasone valerate	12g09-n07	2
Caelo	Betamethasone valerate	12G09-N07	3
Sanacorp	Betamethasone valerate	12G09-N07	1
Noweda	Betamethasone valerate	12G09-N07	4
AHC 01.07.13 EK 48,05	Betamethasone valerate	12K07-N23	1
Bombastus	Betamethasone valerate	12L11-N01	1
Caelo	Betamethasone valerate	12L11-N01	3
Ginkgo-Apotheke	Betamethasone valerate	12L11-N01	1
Phönix	Betamethasone valerate	13091201	2
Caelo	Betamethasone valerate	13091204	6
Caesar & Loretz GmbH, 4…	Betamethasone valerate	13091206	2
Alliance Health 06.02.2…	Betamethasone valerate	13091207	1
Caesar & Loretz GmbH, 4…	Betamethasone valerate	13091211	1
Euro OTC	Betamethasone valerate	13D03-N07	1
Fagron	Betamethasone valerate	13d03-n07	3
Phönix	Betamethasone valerate	13D03-N07	1
Caelo	Betamethasone valerate	13D03-N07	4
Großhandel	Betamethasone valerate	13D03-N07	1
Fagron	Betamethasone valerate	13K29B32	1
Fagron	Betamethasone valerate	13G19-N01	1
Fagron	Betamethasone valerate	14G30-B05-29617	1
Caelo	Betamethasone valerate	18121206	1
Phonix	Betamethasone valerate	13K29-B32	1
Fagron	Betamethasone valerate	20101012-1	1
Euro OTC	Betamethasone valerate	2507211181	1
Fagron	Betamethasone valerate	2B28-N01	1
Caelo	Betamethasone valerate	2x12229813	1
Sanacorp	Betamethasone valerate	3005120l	1
Fagron	Betamethasone valerate	309520	1
Caelo	Betamethasone valerate	B03041205	1
Fagron	Betamethasone valerate	NS0706M	2
Caelo	Betamethasone valerate	3110031	1
Fagron	Betamethasone valerate	NS2072M	2
Fiebig 27.06.13 EK47,81	Betamethasone valerate	B9/131	1
Fagron	Betamethasone valerate	B07-317416	1
Anzag	Betamethasone valerate	11K18N09	1
Euro OTC	Betamethasone valerate	1108045-02	4
Holdermann	Betamethasone valerate	1208014-01	1
Holdermann	Betamethasone valerate	120801402	1
Gehe	Betamethasone valerate	1208014-04	1
Eigenherstellung	Betamethasone valerate	9070313	1
Euro OTC	Betamethasone valerate	120801403	1
Fagron	Betamethasone valerate	1208014-01	1
Caelo	Betamethasone valerate	1203403	1
Caelo	Betamethasone valerate	12K07-N23	1
A.H.D.	Betamethasone valerate	13D03-N07	1
Caelo	Betamethasone valerate	210112	1
Fagron	Betamethasone valerate	90616-2	1
Euro OTC	Betamethasone valerate	1008012-01	2

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Supplier	Substance	Batch	Spectra
PHOENIX am 05.07.2012	Betamethasone valerate	1008012-03	1
Euro OTC	Betamethasone valerate	1008012-02	1
Caesar & Loretz GmbH, 4...	Betamethasone valerate	10296707	1
Caesar & Loretz GmbH 40...	Betamethasone valerate	10296715	1
Anzag am 24.04.2012	Betamethasone valerate	1108045-01	1
Kehr	Betamethasone valerate	1108045-01	1
Noweda	Betamethasone valerate	1108045-01	1
Phönix Gotha	Betamethasone valerate	1108045-02	1
Anzag 07.08.2012	Betamethasone valerate	1108045-03	2
Euro OTC	Betamethasone valerate	110804503	1
Fagron	Betamethasone valerate	11A04-N02	1
Noweda	Betamethasone valerate	11B21-N02	1
Fagron	Betamethasone valerate	11k18-n09	1
anzag am 29.06.2012	Betamethasone valerate	11E18-N03	1
Caelo	Betamethasone valerate	12003402	1
Caelo	Betamethasone valerate	1208014-01	1
Noweda	Betamethasone valerate	1208014-01	1
EuRho	Betamethasone valerate	1208014-02	1
Caelo	Betamethasone valerate	1208014-03	1
	Betamethasone valerate	1208014-04	1
noweda	Betamethasone valerate	1208014-04	1
Fiebig ek: 45,65EUR	Betamethasone valerate	12B28-N01	1
Caelo	Betamethasone valerate	12B28-N01	2
FARGON	Betamethasone valerate	12b28-n01	1
agron/Krieger	Betamethasone valerate	12B2B-N01	1
Großhandel	Betamethasone valerate	12G09-N07	1
Caelo	Betamethasone valerate	12g09-n07	1
AHD,09.04.2013	Betamethasone valerate	12G09-N07	1
Anzag	Betamethasone valerate	12L11-N01	1
Euro OTC	Betamethasone valerate	12L11-N01	1
FARGON	Betamethasone valerate	12l11-n01	1
Europ Ots Pharma	Betamethasone valerate	12l11-N01	1
Caelo	Betamethasone valerate	13091201	2
Noweda	Betamethasone valerate	13091203	2
Caesar&Loretz GmbH/Anzag	Betamethasone valerate	13091210	1
Sanacorp	Betamethasone valerate	13091210	1
Phönix	Betamethasone valerate	13091212	2
Gehe	Betamethasone valerate	13091211	1
Alliance healthcare	Betamethasone valerate	13D03-N07	1
Fagron	Betamethasone valerate	13G19N01	1
Symbiotica	Betamethasone valerate	14H28B01302863	1
Caelo	Betamethasone valerate	3110025	1
Phönix	Betamethasone valerate	BV-BLT186/0512	1
Fagron	Betamethasone valerate	NP1351M	2
Fagron	Betamethasone valerate	NR1545M	1
Euro OTC	Betamethasone valerate	3313U-01181	1

- 75 697 spectra from 463 *Apo-Ident* customers from a total of 25 226 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Betamethasone valerate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this

purpose, all relevant spectra of the various substances were compared with *Betamethasone valerate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	373	0	72 060
Type B	0	509	0	161 564
Type C	0	1446	16	75 697

The substance/substance group *Betamethasone valerate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9887 %)	100.0000 % (> 98.3914 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 98.8212 %)
Type C	100.0000 % (> 99.8849 %)	98.9056 % (> 98.7004 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20887	22249	7.51	31.05
20920	22861	5.84	36.25
21215	22249	4.21	34.32
21566	22249	7.26	33.42
21588	21588	0.00	25.87
21645	22249	5.99	29.64
21674	21674	0.00	35.07
22249	22249	0.00	31.92
22861	22861	0.00	36.40

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Betamethasone, micronized**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20943-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Betamethasone, micronized; Betamethasonum, micronisatum

Special notes

When selecting the *Betamethasone, micronized* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Betamethasone, micronized*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Betamethasone, m...	12D26-N08	20943	40	1402096
Fagron	Betamethasone, m...	13H08-N06	21579	40	1411037
Fagron	Betamethasone, m...	11H31-B06-288219	22493	40	1608324

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Betamethasone, micronized*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 160 spectra from 5 reference samples of the substance/substance group *Betamethasone, micronized*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Betamethasone, micronized	11B18-N14	20271	30
Fagron	Betamethasone, micronized	11B18-N14	20276	30
Fagron	Betamethasone, micronized	13H08-N06	21579†	20
Fagron	Betamethasone, micronized	14C13-B02-296165	22897	40
Fagron	Betamethasone, micronized	15L09-B05-324091	22904	40

- 161 913 spectra from a total of 3495 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 34 spectra from 22 *Apo-Ident* customers from 23 batches from the substance/substance group *Betamethasone, micronized*.

- These include spectra of independent samples from 22 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Betamethasone, micronized	11H31-B06-288217	1
Fagron	Betamethasone, micronized	12D26-N08	1
Fagron	Betamethasone, micronized	12J01-N02	2
Fagron	Betamethasone, micronized	14C13-B02	2
Symbiotec Pharmalab Ltd...	Betamethasone, micronized	14C13-B02	1
Fagron	Betamethasone, micronized	14C13-B02-296154	1
Fagron	Betamethasone, micronized	14C13-B02-296164	3
Fagron	Betamethasone, micronized	14C13-B02-305561	1
Fagron	Betamethasone, micronized	14c13-bo2-305561	1
Fagron	Betamethasone, micronized	9K25-N13	1
Anzag 5.06.2012	Betamethasone, micronized	11K14-N02	1
Fagron	Betamethasone, micronized	9J26-N08	1
Fagron	Betamethasone, micronized	11/14-N02	1
Fagron	Betamethasone, micronized	9071304	1
Caelo	Betamethasone, micronized	11/14-N02	1
BASF/Phönix	Betamethasone, micronized	ZBtBY13004	1
Caelo	Betamethasone, micronized	120104/13	1
Gehe 07.10.13	Betamethasone, micronized	1201-No2	1
Noweda	Betamethasone, micronized	12B20-N05	1
Anzag 13.06.2013	Betamethasone, micronized	12B20-N05	1
Fagron	Betamethasone, micronized	12B20-N05	2
Phönix	Betamethasone, micronized	12B20-N05	1
Fagron	Betamethasone, micronized	12D26-N08	1
Fagron	Betamethasone, micronized	12D26N08	1
Unisan	Betamethasone, micronized	Retest09K25-N13	1
Fiebig	Betamethasone, micronized	12J01-120301-m1	1
Noweda	Betamethasone, micronized	M-XO1-120301m1	1
gehe 11.06.2013	Betamethasone, micronized	M-X01-111201-m1	1
GEHE	Betamethasone, micronized	11/14-N02	1

- 77 125 spectra from 463 *Apo-Ident* customers from a total of 25 524 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Betamethasone, micronized* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Betamethasone, micronized* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	134	26	161 913
Type C	0	21	13	77 125

The substance/substance group *Betamethasone, micronized* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	83.7500 % (> 81.8750 %)
Type C	100.0000 % (> 99.8850 %)	61.7647 % (> 52.9412 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20943	20943	0.00	17.45
21579	21579	0.00	18.48
22493	22493	0.00	15.84

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Bifonazole**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20810-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Bifonazole; Bifonazolum

Special notes

When selecting the *Bifonazole* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Bifonazole*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Bifonazole	1206027-01	20810	40	1312397
Fagron	Bifonazole	12G11-N09	20820	40	20120807
Euro OTC	Bifonazole	1401031-01	21631	40	20140220
Euro OTC	Bifonazole	1510001	22253	40	20151203*
Caelo	Bifonazole	15152701	22906	40	20150703
Caelo	Bifonazole	15152702	22907	40	20150703
Fagron	Bifonazole	16D07-B10-324381	22941	40	20160419

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 280 spectra of 7 reference samples from the substance/substance group *Bifonazole*. These samples are listed above in the section *calibration samples*. The reference samples originate from 7 different batches.

- 72 153 spectra from a total of 1575 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 250 spectra from 7 reference samples of the substance/substance group *Bifonazole*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Bifonazole	11A13-N13	20274	30
Euro OTC	Bifonazole	1401031-01	21631†	20
Euro OTC	Bifonazole	1510001	22253†	20
Caelo	Bifonazole	15152702	22955	40
Caelo	Bifonazole	151527	23364	40
Euro OTC	Bifonazole	1703041	23395	40
Euro OTC	Bifonazole	1510001	22253SI	60

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 823 spectra from a total of 3493 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 36 spectra from 21 *Apo-Ident* customers from 22 batches from the substance/substance group *Bifonazole*.

- These include spectra of independent samples from 19 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Bifonazole	11071202	1
Euro OTC	Bifonazole	1206027-01	2
Fagron	Bifonazole	11F20-N06	1
Fagron	Bifonazole	12E29-N03	4
Euro OTC	Bifonazole	1206027-02	1
Euro OTC	Bifonazole	13G10N02	1
Fagron	Bifonazole	12G11-N09	2
Fagron	Bifonazole	13G10-N02	1
Fagron	Bifonazole	13a11-n06	1
Fagron	Bifonazole	14K10-B01-300541	5
Fagron	Bifonazole	14C28-B03-292388	1
Fagron	Bifonazole	14K10-B01-306783	3
Fagron	Bifonazole	14K10-B01-308349	1
Fagron	Bifonazole	14K10-B01-312067	1
Fagron	Bifonazole	14K10-B01-316618	1
Euro OTC	Bifonazole	1510001-02	3
Caelo	Bifonazole	15152701	2
Gehe	Bifonazole	15152703	1
Fagron	Bifonazole	16D07-B10-321576	1
Fagron	Bifonazole	16D07-B10-32480	1
Fagron	Bifonazole	16D07-B10-324380	1
Fargon	Bifonazole	14k10-b01-300541	1

- 77 123 spectra from 463 *Apo-Ident* customers from a total of 25 526 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Bifonazole* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Bifonazole* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	280	0	72 153
Type B	0	249	1	161 823
Type C	0	36	0	77 123

The substance/substance group *Bifonazole* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.8571 %)
Type B	100.0000 % (> 99.9928 %)	99.6000 % (> 98.4000 %)
Type C	100.0000 % (> 99.8850 %)	100.0000 % (> 83.3333 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20810	20810	0.00	35.72
20820	22253	8.17	33.70
21631	22253	3.15	40.02
22253	22253	0.00	37.95
22906	22253	5.39	36.86
22907	22253	6.59	36.24
22941	22253	6.08	35.98

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Biotin**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20414-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Biotin; Biotinum

Special notes

When selecting the *Biotin* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Biotin*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Biotin	13K29-N02	21221	40	20131204
Euro OTC	Biotin	1402028-01	21632	40	20140404
Euro OTC	Biotin	1508030	21904	40	20150925*
Euro OTC	Biotin	1610003	22855	40	20161110*
Caelo	Biotin	16164313	22902	40	20160216

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 200 spectra of 5 reference samples from the substance/substance group *Biotin*. These samples are listed above in the section *calibration samples*. The reference samples originate from 5 different batches.

- 72 233 spectra from a total of 1577 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 360 spectra from 10 reference samples of the substance/substance group *Biotin*.

- These include spectra of independent samples from 6 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Biotin	10I17-N08	20414	40
Euro OTC	Biotin	1402028-01	21632†	20
Euro OTC	Biotin	1508030	21904†	20
Euro OTC	Biotin	1603017	22507	40
Caelo	Biotin	16164313	22901	40
Caelo	Biotin	163432	23029	40
Caelo	Biotin	163432	23063	40
Euro OTC	Biotin	1708007	23728	40
Caelo	Biotin	173152	23829	40
Euro OTC	Biotin	1802022	23955	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 713 spectra from a total of 3490 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 33 spectra from 16 *Apo-Ident* customers from 21 batches from the substance/substance group *Biotin*.

- These include spectra of independent samples from 19 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Euro OTC	Biotin	2041517	1
EuRho	Biotin	111039-01	1
Euro OTC	Biotin	3021501	1
Euro OTC	Biotin	1111039-02	2
Fagron	Biotin	12111302	1
Caelo	Biotin	12A23-N03	1
Euro OTC	Biotin	1111039-03	1
Fagron	Biotin	12A23-N03	1
Fagron	Biotin	12C14-N01	2
Euro OTC	Biotin	1301026-01	3
Euro OTC	Biotin	1402028-01	3
Caelo	Biotin	13K29-N02	2
Caelo	Biotin	1402028-01	2
Euro OTC	Biotin	1411047-01	2
Euro OTC	Biotin	1610003-02	1
Fagron	Biotin	14d04-b07-292963	1
Euro OTC	Biotin	28071506	1
Euro OTC	Biotin	1610003-01	1
Fagron	Biotin	13081203	1
Euro OTC	Biotin	1111039-01	1
Fagron	Biotin	1017-N08	1
Fagron	Biotin	13111202	1
Fagron	Biotin	13K29-N02	1
Fagron	Biotin	20110634	1

- 77 126 spectra from 463 *Apo-Ident* customers from a total of 25 526 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Biotin* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Biotin* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	200	0	72 233
Type B	0	360	0	161 713
Type C	0	33	0	77 126

The substance/substance group *Biotin* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 98.3333 %)
Type C	100.0000 % (> 99.8850 %)	100.0000 % (> 81.8182 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21221	21904	7.25	76.81
21632	21904	3.10	69.27
21904	21904	0.00	73.49
22855	22855	0.00	73.37
22902	21904	4.49	69.10

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Bismuth gallath, basic**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	21252-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Bismuth gallath, basic; Bismuthi subgallas; Bismutum subgallicum

Special notes

When selecting the *Bismuth gallath, basic* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Bismuth gallath, basic*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Bismuth gallath,...	13179105	21252	40	1412254
Fagron	Bismuth gallath,...	15B02-B04-309481	22597	40	20150226
Caelo	Bismuth gallath,...	17004102	23372	40	20170214
Fagron	Bismuth gallath,...	16K17-B04-335597	23570	40	20170623

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 4 reference samples from the substance/substance group *Bismuth gallath, basic*. These samples are listed above in the section *calibration samples*. The reference samples originate from 4 different batches.

- 72 273 spectra from a total of 1578 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 180 spectra from 4 reference samples of the substance/substance group *Bismuth gallath, basic*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
zu erfassen	Bismuth gallath, basic	`zu erfassen`	20466	40
Caelo	Bismuth gallath, basic	`13179105`	21553	60
Fagron	Bismuth gallath, basic	`15J26-B02-317883`	22598	40
Caelo	Bismuth gallath, basic	`170041`	23359	40

- 161 893 spectra from a total of 3496 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details

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provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 250 spectra from 134 *Apo-Ident* customers from 111 batches from the substance/substance group *Bismuth gallath, basic*.

- These include spectra of independent samples from 107 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Bismuth gallath, basic	9K26-N10	2
Fagron	Bismuth gallath, basic	12C13-N03	4
siehe WE-Prüfprotokoll	Bismuth gallath, basic	4/09	1
Caelo	Bismuth gallath, basic	12172402	4
Fagron	Bismuth gallath, basic	13/18-B13294098	1
sanacorp	Bismuth gallath, basic	13/1818B13-292057	1
Fagron	Bismuth gallath, basic	12B02-B04-304408	1
Caelo	Bismuth gallath, basic	13/18-B13-292057	1
Fagron	Bismuth gallath, basic	13/18-B-13-292057	1
Caelo	Bismuth gallath, basic	12172409	7
Caelo	Bismuth gallath, basic	12172412	1
Fagron	Bismuth gallath, basic	13/18-B13-292058	2
Bombastus	Bismuth gallath, basic	13/18-B13-292058	1
Fagron	Bismuth gallath, basic	13/18-B13-294108	3
Caelo	Bismuth gallath, basic	13/18-B13-292058	1
Caelo	Bismuth gallath, basic	13179105	1
Caelo	Bismuth gallath, basic	13179101	1
Fagron	Bismuth gallath, basic	13/18-B13-294098	1
Caelo	Bismuth gallath, basic	13179111	7
Fagron	Bismuth gallath, basic	13179111	1
Fagron	Bismuth gallath, basic		1
Fagron	Bismuth gallath, basic	1318B13294108	1
Fagron	Bismuth gallath, basic	1318-B13-292057	1
Fagron	Bismuth gallath, basic	1318b13292058	1
Fagron	Bismuth gallath, basic	1318-b13-292058	1
Bombastus	Bismuth gallath, basic	13G10-N12	1
Fagron	Bismuth gallath, basic	13G10-N12	6
ahd/lamotte	Bismuth gallath, basic	13718b13292058	1
Fagron	Bismuth gallath, basic	13I18-B13	5
Caelo	Bismuth gallath, basic	13I18-B13	1
Fagron	Bismuth gallath, basic	13I18-b13-292057	1
Fagron	Bismuth gallath, basic	13I18-B13-292057	1
Fagron	Bismuth gallath, basic	13I18-B13-294098	4
Fagron	Bismuth gallath, basic	13I18-B13-294108	5
Caelo	Bismuth gallath, basic	13I18-B13-294108	1
Fagron	Bismuth gallath, basic	13K08-N03	3
Caelo	Bismuth gallath, basic	14224103	3
Fagron	Bismuth gallath, basic	14H13-B07-303639	3
Caelo	Bismuth gallath, basic	15080602	2
Infectopharm	Bismuth gallath, basic	14224103	1
Fagron	Bismuth gallath, basic	14H13B07303639	1
Fagron	Bismuth gallath, basic	15/26-B02-320473	1
Alliance H.	Bismuth gallath, basic	15080602	1
Caelo	Bismuth gallath, basic	15080606	4
Caelo	Bismuth gallath, basic	15080603	1
Caelo	Bismuth gallath, basic	15200913	1
Caelo	Bismuth gallath, basic	15200904	2
Caelo	Bismuth gallath, basic	15200911	1
Caelo	Bismuth gallath, basic	15200905	1
Caelo	Bismuth gallath, basic	1520910	1

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Supplier	Substance	Batch	Spectra
Allianz Healthcare	Bismuth gallath, basic	15200911	1
Caelo	Bismuth gallath, basic	15200907	1
Caelo	Bismuth gallath, basic	1520913	1
Phoenix	Bismuth gallath, basic	1520913	1
Fagron	Bismuth gallath, basic	15B02-B04	1
Caelo	Bismuth gallath, basic	15B02B04304413	1
Caelo	Bismuth gallath, basic	15B02-B04-304408	3
Fagron	Bismuth gallath, basic	15B02-B04-304408	4
Fagron	Bismuth gallath, basic	15B02-B04-209481	1
Fagron	Bismuth gallath, basic	15b02b04304408	1
Fagron	Bismuth gallath, basic	15B02-B04-304413	3
Caelo	Bismuth gallath, basic	15B02-B04-309481	1
Fargon/ Noweda	Bismuth gallath, basic	15B02-B04-309481	1
Fagron	Bismuth gallath, basic	15B02-B04-309481	4
Fagron	Bismuth gallath, basic	15b02-b4-304413	1
Fagron	Bismuth gallath, basic	15B02-B04-311878	1
Fagron	Bismuth gallath, basic	15C27-B02-311879	1
Caelo	Bismuth gallath, basic	15J26B02-321313	1
Fagron	Bismuth gallath, basic	15J26-B022	1
Fagron	Bismuth gallath, basic	15H05-B07-311880	3
Fagron	Bismuth gallath, basic	15b02-B04-309481	1
Fagron	Bismuth gallath, basic	15H05-B07	1
Fagron	Bismuth gallath, basic	15J26-B02-317883	5
Fagron	Bismuth gallath, basic	15J26-B02-320473	2
Fagron	Bismuth gallath, basic	15J26-B02-321313	4
Fargon GmbH & Co.KG	Bismuth gallath, basic	15J26-B02-321313	2
phönix	Bismuth gallath, basic	15J26-B02-325450	1
Fagron	Bismuth gallath, basic	15J26-B02-325450	1
Fagron	Bismuth gallath, basic	15J26-B02-325472	1
Caelo	Bismuth gallath, basic	16038308	7
Caelo	Bismuth gallath, basic	16038310	4
Caesar & Loretz GmbH Hi...	Bismuth gallath, basic	16038308	1
Caelo	Bismuth gallath, basic	16K17-B04-335597	1
Frago/Noweda	Bismuth gallath, basic	16K17-B04-335597	1
Fagron	Bismuth gallath, basic	16K17-B04-335597	1
Caelo	Bismuth gallath, basic	17004102	3
Caesar & Loretz GmbH	Bismuth gallath, basic	17004102	1
Caelo	Bismuth gallath, basic	2012006724	1
Fagron	Bismuth gallath, basic	2012006724	2
Caelo	Bismuth gallath, basic	17004106	2
Caelo	Bismuth gallath, basic	23121410	1
Fagron	Bismuth gallath, basic	2014006082	1
Fagron	Bismuth gallath, basic	2015000361	1
Fagron	Bismuth gallath, basic	5121	1
Caelo	Bismuth gallath, basic	2414E-01185	1
Fagron	Bismuth gallath, basic	2015007568	1
Caelo	Bismuth gallath, basic	81297468	5
Caelo	Bismuth gallath, basic	9205701	1
Caelo	Bismuth gallath, basic	9205703	2
Phoenix, Jembke	Bismuth gallath, basic	10135101	1
Caelo	Bismuth gallath, basic	10D23-N05	1
Fagron	Bismuth gallath, basic	11F15-N03	1
Fagron	Bismuth gallath, basic	10H31-N01	1
Caelo	Bismuth gallath, basic	1127203	1
Sanacorp	Bismuth gallath, basic	12/13-N11	1
Caelo	Bismuth gallath, basic	11127203	1
Phönix	Bismuth gallath, basic	12-13-N11	1
Caelo	Bismuth gallath, basic	12166901	2
Fagron	Bismuth gallath, basic	12/13-N11	1
Caelo	Bismuth gallath, basic	1217240	1

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Supplier	Substance	Batch	Spectra
Gehe	Bismuth gallath, basic	12172401	1
Alliance	Bismuth gallath, basic	12172402	1
Caelo	Bismuth gallath, basic	12172401	1
Caelo	Bismuth gallath, basic	12c13-no3	1
Caelo	Bismuth gallath, basic	12c13-n03	1
Anzag	Bismuth gallath, basic	12e16-n03	1
Fagron	Bismuth gallath, basic	12E16-N03	1
Fagron	Bismuth gallath, basic	12E16-N03	1
Klenk	Bismuth gallath, basic	12E16-N03	1
Phönix	Bismuth gallath, basic	12E16-N03	1
Caelo	Bismuth gallath, basic	12E16-N03	1
Fagron	Bismuth gallath, basic	12K26-N01	4
Fagron	Bismuth gallath, basic	13D19-N02	6
Caelo	Bismuth gallath, basic	13D19-N02	2
Apomix/Noweda	Bismuth gallath, basic	13D19-N02	1
Sanacorp	Bismuth gallath, basic	13D19-N02	1
Alliance Healthcare	Bismuth gallath, basic	13D19-N02	2
Fargron	Bismuth gallath, basic	13D19-N02	1
Fagron	Bismuth gallath, basic	13E21-N03	2
Fagron	Bismuth gallath, basic	2010002685	2
PHOENIX am 17.01.2014	Bismuth gallath, basic	2012006724	1
Fagron	Bismuth gallath, basic	2012000059	3
Fagron	Bismuth gallath, basic	2015005560	1
Anzag	Bismuth gallath, basic	2012000059	2
Caelo	Bismuth gallath, basic	5208I-01185	1
Caelo	Bismuth gallath, basic	B-150513-1	1
Caelo	Bismuth gallath, basic	8129768	1
Fagron	Bismuth gallath, basic	411092-3-P	1
Caelo	Bismuth gallath, basic	92057409	1
Fargon	Bismuth gallath, basic	13/18-B13-294108	1
Fagron	Bismuth gallath, basic	14H13-B07	1
Caelo	Bismuth gallath, basic	12C13-N03	1
Caelo	Bismuth gallath, basic	12I13-N11	1
Martinus Apotheke	Bismuth gallath, basic	keine	1
Fagron	Bismuth gallath, basic	13i18-b13-294108	1
Fagron	Bismuth gallath, basic	13I18-B13-292058	1

- 76 909 spectra from 463 *Apo-Ident* customers from a total of 25 437 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Bismuth gallath, basic* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Bismuth gallath, basic* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	155	5	72 273
Type B	0	104	76	161 893
Type C	0	220	30	76 909

The substance/substance group *Bismuth gallath, basic* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	96.8750 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	57.7778 % (> 56.1111 %)
Type C	100.0000 % (> 99.8850 %)	88.0000 % (> 86.8000 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21252	21252	0.00	139.80
22597	21252	10.10	140.47
23372	21252	3.14	142.47
23570	21252	3.00	138.50

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Boric acid**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	`20182-2018-07-18`
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Boric acid; Acidum boricum

Special notes

When selecting the *Boric acid* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Boric acid*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Boric acid	`13I04-N06`	21228	40	20130920
Caelo	Boric acid	`14133119`	21804	40	20140509
Caelo	Boric acid	`15425112`	22964	40	20160104
Caelo	Boric acid	`170613`	23286	40	20170316*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 4 reference samples from the substance/substance group *Boric acid*. These samples are listed above in the section *calibration samples*. The reference samples originate from 4 different batches.

- 72 273 spectra from a total of 1578 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 150 spectra from 4 reference samples of the substance/substance group *Boric acid*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Boric acid	09L21-N08	20182	50
Caelo	Boric acid	14133119	21804†	20
Caelo	Boric acid	15242903	22965	40
Fagron	Boric acid	15L09-B07-322988	23746	40

- 161 923 spectra from a total of 3495 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 35 spectra from 23 *Apo-Ident* customers from 28 batches from the substance/substance group *Boric acid*.

- These include spectra of independent samples from 26 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Boric acid	14133113	2
Caelo	Boric acid	9324021	1
Caelo	Boric acid	2808A-01019	1
Fagron	Boric acid	12G04-N10	1
Fagron	Boric acid	13I04-N06	3
Caelo	Boric acid	14133119	1
Caelo	Boric acid	15095103	2
Sanacorp	Boric acid	1/AKD3	1
Caelo	Boric acid	812Q-01018	1
Caelo	Boric acid	11D13-N08	1
Caelo	Boric acid	10227913	1
Fagron	Boric acid	14133101	1
Caelo	Boric acid	14095202	1
Caelo	Boric acid	12260537	1
Fagron	Boric acid	14B07-B02-295752	1
Caelo	Boric acid	15425101	4
Caelo	Boric acid	9324036	1
Caelo	Boric acid	15425118	1
Fagron	Boric acid	11d13-n08	1
Caelo	Boric acid	9324043	1
Caelo	Boric acid	12260502	1
Caelo	Boric acid	12238901	1
Fagron	Boric acid	11I26-n05	1
Nachprüfung	Boric acid		1
Caelo	Boric acid	12260507	1
Caelo	Boric acid	12260519	1
Caelo	Boric acid	1234	1
Fagron	Boric acid	12f01-n08	1

- 77 124 spectra from 463 *Apo-Ident* customers from a total of 25 521 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Boric acid* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all

relevant spectra of the various substances were compared with *Boric acid* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	160	0	72 273
Type B	0	150	0	161 923
Type C	0	35	0	77 124

The substance/substance group *Boric acid* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 96.0000 %)
Type C	100.0000 % (> 99.8850 %)	100.0000 % (> 82.8571 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21228	23286	11.77	52.29
21804	23286	14.76	52.22
22964	23286	6.77	52.08
23286	23286	0.00	51.96

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Budesonide, micronized**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20569-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Budesonide, micronized; Budesonidum micronisatum

Special notes

When selecting the *Budesonide, micronized* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Budesonide, micronized*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Budesonide, micr…	11351704	20808	30	AR-15-FG-005286-01
Euro OTC	Budesonide, micr…	1311022-01	21620	40	20140113
Euro OTC	Budesonide, micr…	1604018	22537	40	20160509*
Caelo	Budesonide, micr…	161431	22627	40	20160606*
Caelo	Budesonide, micr…	15344004	22649	40	20151116

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Budesonide, micr…	16J04-B01-326581	22888	40	20161026
Euro OTC	Budesonide, micr…	1311022-01	21620SI	25	20140113
Euro OTC	Budesonide, micr…	1604018	22537SI	23	20160509*
Caelo	Budesonide, micr…	161431	22627SI	25	20160606*
Caelo	Budesonide, micr…	15344004	22649SI	30	20151116
Fagron	Budesonide, micr…	16J04-B01-326581	22888SI	30	20161026

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 363 spectra of 11 reference samples from the substance/substance group *Budesonide, micronized*. These samples are listed above in the section *calibration samples*. The reference samples originate from 6 different batches.

- 72 070 spectra from a total of 1576 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 356 spectra from 12 reference samples of the substance/substance group *Budesonide, micronized*.

- These include spectra of independent samples from 4 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Budesonide, micronized	11351706	20569	40
Caelo	Budesonide, micronized	11351706	20800	40

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*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Budesonide, micronized	1311022-01	21620[†]	20
Fagron	Budesonide, micronized	16J04-B01-326581	22841	40
Caelo	Budesonide, micronized	170788	23279	40
Euro OTC	Budesonide, micronized	1709022	23778	40
Caelo	Budesonide, micronized	180749	24026	40
Euro OTC	Budesonide, micronized	1311022-01	21620SI[†]	12
Fagron	Budesonide, micronized	16J04-B01-326581	22841SI	24
Caelo	Budesonide, micronized	170788	23279SI	20
Euro OTC	Budesonide, micronized	1709022	23778SI	20
Caelo	Budesonide, micronized	180749	24026SI	20

- 161 717 spectra from a total of 3493 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 125 spectra from 49 *Apo-Ident* customers from 62 batches from the substance/substance group *Budesonide, micronized*.

- These include spectra of independent samples from 61 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Budesonide, micronized	12295105	1
Caelo	Budesonide, micronized	12295106	2
Caelo	Budesonide, micronized	12295108	1
Caelo	Budesonide, micronized	12295109	3
Caelo	Budesonide, micronized	12295110	3
Caelo	Budesonide, micronized	12295111	5
Caelo	Budesonide, micronized	1305004-01	2
Euro OTC	Budesonide, micronized	1311022-01	3
Fagron	Budesonide, micronized	13A07-N09	2
Caelo	Budesonide, micronized	140711707	1
Fagron	Budesonide, micronized	13H22-N03	3
Phoenix	Budesonide, micronized	14071702	3
Caelo	Budesonide, micronized	14071702	6
Caelo	Budesonide, micronized	14071701	1
sanacorp	Budesonide, micronized	14071701	1
Caelo	Budesonide, micronized	14071706	1
Caelo	Budesonide, micronized	14071707	2
Caelo	Budesonide, micronized	14071714	4
Caelo	Budesonide, micronized	14071713	1
Caelo	Budesonide, micronized	14071716	2
Fagron	Budesonide, micronized	14H15-B02	3

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[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Supplier	Substance	Batch	Spectra
Fagron	Budesonide, micronized	14A30-B09291366	1
Caelo	Budesonide, micronized	14071717	3
Fagron	Budesonide, micronized	14A30-B09-291366	2
Caelo	Budesonide, micronized	1471707	1
Fagron	Budesonide, micronized	14H15-B02-297925	1
Fagron	Budesonide, micronized	14H15-B02-301971	1
Fagron	Budesonide, micronized	14H15-B02-297926	1
Fagron	Budesonide, micronized	14H15-B02-301972	1
Caelo	Budesonide, micronized	15173803	5
Caelo	Budesonide, micronized	15173802	2
Caelo	Budesonide, micronized	15173806	1
Caelo	Budesonide, micronized	15173807	2
Caelo	Budesonide, micronized	15173810	2
Caelo	Budesonide, micronized	15344003	5
Caelo	Budesonide, micronized	15173811	4
Caelo	Budesonide, micronized	15173812	1
Caelo	Budesonide, micronized	15344005	2
Caelo	Budesonide, micronized	15344008	2
Caelo	Budesonide, micronized	15344010	3
Fagron	Budesonide, micronized	15E27B10	1
Fagron	Budesonide, micronized	15E27-B10-308322	1
Fagron	Budesonide, micronized	15E27-B10-315704	1
Caelo	Budesonide, micronized	15344012	2
Caelo	Budesonide, micronized	16143102	1
Fagron	Budesonide, micronized	15E27-B10-308321	1
Caelo	Budesonide, micronized	17078801	2
Caelo	Budesonide, micronized	16143101	1
Bombastus	Budesonide, micronized	21100M1A0021321	1
Fagron	Budesonide, micronized	21100M1B0011621	1
Fagron	Budesonide, micronized	2184	1
Caelo	Budesonide, micronized	ChB14071717	1
Caelo	Budesonide, micronized	11175015	1
Caelo	Budesonide, micronized	11351701	1
Caelo	Budesonide, micronized	11351706	5
Caelo	Budesonide, micronized	11175014	2
Caelo	Budesonide, micronized	11351707	3
Caelo	Budesonide, micronized	12295103	1
Caelo	Budesonide, micronized	11351713	1
Fagron	Budesonide, micronized	12G23-N01	2
Fagron	Budesonide, micronized	12J29-N05	1
Caelo	Budesonide, micronized	21100M1	1
VDl 23.10.14 19,50 euro	Budesonide, micronized	14071707	1
Caelo	Budesonide, micronized	11351703	1
Sanacorp,	Budesonide, micronized	16143103	1

- 77 034 spectra from 463 *Apo-Ident* customers from a total of 25 485 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Budesonide, micronized* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Budesonide, micronized*

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and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	363	0	72 070
Type B	0	356	0	161 717
Type C	0	125	0	77 034

The substance/substance group *Budesonide, micronized* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9887 %)	100.0000 % (> 98.3471 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 98.3146 %)
Type C	100.0000 % (> 99.8850 %)	100.0000 % (> 95.2000 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20808	20808	0.00	37.03
21620	20808	6.35	34.83
22537	22537	0.00	29.81
22627	22627	0.00	36.16
22649	20808	6.95	34.51
22888	22627	6.01	34.28

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Butylated hydroxytoluene**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	21307-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Butylated hydroxytoluene; Butylhydroxytoluenum; Butylhydroxytoluolum

Special notes

When selecting the *Butylated hydroxytoluene* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Butylated hydroxytoluene*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Butylated hydrox…	13354602	21307	40	20131105
Caelo	Butylated hydrox…	13354604	21355	40	AR-15-FG-007846-02
Caelo	Butylated hydrox…	15172103	22350	40	20150529

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Butylated hydroxytoluene*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 260 spectra from 6 reference samples of the substance/substance group *Butylated hydroxytoluene*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Butylated hydroxytoluene	11131002	20282	40
Caelo	Butylated hydroxytoluene	15172103	21911	60
Caelo	Butylated hydroxytoluene	15172103	22281	60
Caelo	Butylated hydroxytoluene	15172103	22350†	20
Caelo	Butylated hydroxytoluene	163163	23356	40
Caelo	Butylated hydroxytoluene	180291	24019	40

- 161 813 spectra from a total of 3495 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 181 spectra from 126 *Apo-Ident* customers from 43 batches from the substance/substance group *Butylated hydroxytoluene*.

- These include spectra of independent samples from 40 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Butylated hydroxytoluene	2170717	1
Caelo	Butylated hydroxytoluene	12280206	5
Caelo	Butylated hydroxytoluene	716M-02851	1
Caelo	Butylated hydroxytoluene	13354602	6
Caelo	Butylated hydroxytoluene	7031403	1
Caelo	Butylated hydroxytoluene	12382309	7
Caelo	Butylated hydroxytoluene	13354604	7
Gehe	Butylated hydroxytoluene	13354604	1
Caelo	Butylated hydroxytoluene	13354609	3
Caelo	Butylated hydroxytoluene	13354611	3
Bombastus	Butylated hydroxytoluene	13354604	1
Phoenix	Butylated hydroxytoluene	13354609	1
Caelo	Butylated hydroxytoluene	143004502	1
Caelo	Butylated hydroxytoluene	1400501	1
Caelo	Butylated hydroxytoluene	14300501	9
Caelo	Butylated hydroxytoluene	14300502	6
Caelo	Butylated hydroxytoluene	14300505	5
Caelo	Butylated hydroxytoluene	15094501	7
Caelo	Butylated hydroxytoluene	14300506	1
Sanacorp	Butylated hydroxytoluene	14300505	1
Caelo	Butylated hydroxytoluene	15172101	8
sanacorp	Butylated hydroxytoluene	15172103	1
Caelo	Butylated hydroxytoluene	15172103	17
Noweda	Butylated hydroxytoluene	15172103	1
Caesar & Loretz GmbH Hi...	Butylated hydroxytoluene	15172103	1
Caelo	Butylated hydroxytoluene	15172105	9
Fagron	Butylated hydroxytoluene	15426801	1
Caelo	Butylated hydroxytoluene	15426801	2
Phoenix	Butylated hydroxytoluene	15426801	1
Celo	Butylated hydroxytoluene	15426801	1
Gehe	Butylated hydroxytoluene	15426807	1
Caelo	Butylated hydroxytoluene	15426807	8
Caesar & Loretz	Butylated hydroxytoluene	15426801	1
Caelo	Butylated hydroxytoluene	16316301	3
Caelo	Butylated hydroxytoluene	16316305	1
Caelo	Butylated hydroxytoluene	122080206	1
Sanacorp	Butylated hydroxytoluene	16316305	1
Caelo	Butylated hydroxytoluene	12280201	2
Caelo	Butylated hydroxytoluene	11131006	2
Caelo	Butylated hydroxytoluene	16316304	1
Caelo	Butylated hydroxytoluene	16316307	1
Phoenix	Butylated hydroxytoluene	3111201	1
Noweda	Butylated hydroxytoluene	12158201	1
Caelo	Butylated hydroxytoluene	12158201	3
Fagron	Butylated hydroxytoluene	11308701	1
Caelo	Butylated hydroxytoluene	12158204	5
Anzag 24.10.12	Butylated hydroxytoluene	12207004	1
Caelo	Butylated hydroxytoluene	12207005	4

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Supplier	Substance	Batch	Spectra
Caelo	Butylated hydroxytoluene	12280203	8
Caelo	Butylated hydroxytoluene	1220705	1
Caelo	Butylated hydroxytoluene	12382302	7
Großhandel	Butylated hydroxytoluene	12280206	1
Anzag 122.04.13 ek: 3,76EUR	Butylated hydroxytoluene	12280206	1
Caelo	Butylated hydroxytoluene	12382304	7
Noweda	Butylated hydroxytoluene	12382304	1
Phoenix	Butylated hydroxytoluene	12382305	1
Caelo	Butylated hydroxytoluene	12382307	3
Caelo	Butylated hydroxytoluene	12382312	1
Caelo	Butylated hydroxytoluene	20161112-1	1
Caelo	Butylated hydroxytoluene	2113U02851	1

- 76 978 spectra from 463 *Apo-Ident* customers from a total of 25 504 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Butylated hydroxytoluene* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Butylated hydroxytoluene* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	260	0	161 813
Type C	0	173	8	76 978

The substance/substance group *Butylated hydroxytoluene* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 97.6923 %)
Type C	100.0000 % (> 99.8850 %)	95.5801 % (> 93.9227 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

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Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21307	21355	4.27	73.49
21355	21355	0.00	72.36
22350	21355	1.17	69.82

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Caffeine**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20962-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Caffeine; Coffeinum

Special notes

When selecting the *Caffeine* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Caffeine*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Caffeine	1211012-01	20962	40	1412248
Caelo	Caffeine	12317911	21205	40	20121113
Caelo	Caffeine	13233105	21456	40	20131008
Caelo	Caffeine	13233104	21548	40	20131008

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 4 reference samples from the substance/substance group *Caffeine*. These samples are listed above in the section *calibration samples*. The reference samples originate from 4 different batches.

- 72 273 spectra from a total of 1578 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 250 spectra from 7 reference samples of the substance/substance group *Caffeine*.

- These include spectra of independent samples from 4 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Caffeine	2910019-03	20247	50
Caelo	Caffeine	12317911	21089	40
Caelo	Caffeine	13233105	21456†	20
Caelo	Caffeine	13233104	21548†	20
Euro OTC	Caffeine	1603009	22517	40
Caelo	Caffeine	15082303	22823	40
Euro OTC	Caffeine	1703006	23140	40

- 161 823 spectra from a total of 3492 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 94 spectra from 52 *Apo-Ident* customers from 40 batches from the substance/substance group *Caffeine*.

- These include spectra of independent samples from 38 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Caffeine	9301807	1
Caelo	Caffeine	11076807	2
Caelo	Caffeine		2
Euro OTC	Caffeine	1109017-01	2
Caelo	Caffeine	11111111	1
Anzag 03.05.2013	Caffeine	1205047-01	1
Fagron	Caffeine	12093402	2
Caelo	Caffeine	12093418	2
Euro OTC	Caffeine	1211012-01	1
Caelo	Caffeine	12093410	2
Caelo	Caffeine	1211012-01	1
Euro OTC	Caffeine	1211012-02	1
Caelo	Caffeine	12317902	1
Caelo	Caffeine	12317904	2
Caelo	Caffeine	12317906	1
Caelo	Caffeine	12317909	7
Caelo	Caffeine	12317914	2
Euro OTC	Caffeine	1307049-01	4
Caelo	Caffeine	13233105	4
Caelo	Caffeine	13233111	5
Euro OTC	Caffeine	1411015-01	5
Noweda	Caffeine	1404026-01	1
Caelo	Caffeine	1503020-01	2
Euro OTC	Caffeine	1503020-01	6
Euro OTC	Caffeine	1503020-02	7
Caelo	Caffeine	15054704	2
Caelo	Caffeine	15054709	2
Caelo	Caffeine	15082311	1
Euro OTC	Caffeine	1603009/01	1
Caelo	Caffeine	15375012	2
Euro OTC	Caffeine	160300901	1
Caelo	Caffeine	15375006	2
Euro OTC	Caffeine	1603009-01	2
Phönix	Caffeine	1603009-02	1
Euro OTC	Caffeine	1703006-01	5
Euro OTC	Caffeine	188921AX20	1
Euro OTC	Caffeine	26081406	1
Caelo	Caffeine	3212E-01281	1
Gatt-Koller / Phoenix	Caffeine	5898/12135213	2
Euro OTC	Caffeine	325241AX20	1
ACM	Caffeine	KNC1294J14	2
EUro/AHD	Caffeine	121012-01	1
EUro/AHD	Caffeine	1307049-01	1

- 77 065 spectra from 463 *Apo-Ident* customers from a total of 25 509 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Caffeine* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Caffeine* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	160	0	72 273
Type B	0	245	5	161 823
Type C	0	92	2	77 065

The substance/substance group *Caffeine* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9928 %)	98.0000 % (> 96.8000 %)
Type C	100.0000 % (> 99.8850 %)	97.8723 % (> 94.6809 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20962	20962	0.00	44.26
21205	20962	6.12	43.39
21456	20962	6.08	42.64
21548	20962	3.93	44.34

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Calcium ascorbate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20393-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Calcium ascorbate; Calcii ascorbas; Calcii ascorbinicum

Special notes

When selecting the *Calcium ascorbate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Calcium ascorbate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Calcium ascorbate	13105624	21313	40	20130620
Euro OTC	Calcium ascorbate	1612003	22916	40	20170110*
Euro OTC	Calcium ascorbate	1709005	23609	40	20170914*
Euro OTC	Calcium ascorbate	1709004	23611	40	20170914*
Euro OTC	Calcium ascorbate	1801010	23884	40	20180115*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 200 spectra of 5 reference samples from the substance/substance group *Calcium ascorbate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 5 different batches.

- 72 233 spectra from a total of 1577 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 160 spectra from 4 reference samples of the substance/substance group *Calcium ascorbate*.

- These include spectra of independent samples from 4 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Calcium ascorbate	10365208	20393	40
Euro OTC	Calcium ascorbate	1607033-01	22812	40
Caelo	Calcium ascorbate	163111	23060	40
Caelo	Calcium ascorbate	16311101	23518	40

- 161 913 spectra from a total of 3495 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B*

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 11 spectra from 7 *Apo-Ident* customers from 11 batches from the substance/substance group *Calcium ascorbate*.

- These include spectra of independent samples from 11 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Calcium ascorbate	14340907	1
Caelo	Calcium ascorbate	15324708	1
Euro OTC	Calcium ascorbate	L1502018-01	1
Burton Feingold	Calcium ascorbate	L008415	1
Euro OTC	Calcium ascorbate	L1508017-01	1
Euro OTC	Calcium ascorbate	L15218-2	1
Caelo	Calcium ascorbate	11159915	1
Caelo	Calcium ascorbate	L1502018-02	1
Caelo	Calcium ascorbate	12097406	1
Caelo	Calcium ascorbate	13105608	1
Farmalabor / Farmalabor	Calcium ascorbate	P1104931-000A	1

- 77 148 spectra from 463 *Apo-Ident* customers from a total of 25 536 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Calcium ascorbate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Calcium ascorbate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	200	0	72 233
Type B	0	160	0	161 913
Type C	0	11	0	77 148

The substance/substance group *Calcium ascorbate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 96.2500 %)
Type C	100.0000 % (> 99.8851 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21313	23609	1.88	43.54
22916	22916	0.00	43.15
23609	23609	0.00	44.05
23611	23611	0.00	44.52
23884	23884	0.00	35.42

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Calcium citrate tetrahydrate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20013-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Calcium citrate tetrahydrate; Calcii citras tetrahydricus; Calcii citricum

Special notes

When selecting the *Calcium citrate tetrahydrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Calcium citrate tetrahydrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Calcium citrate …	1305018-01	21249	40	20130528
Caelo	Calcium citrate …	13391203	21486	40	20131205
Euro OTC	Calcium citrate …	1509039	21931	40	20151013*
Euro OTC	Calcium citrate …	1509039-01	22255	40	20151013
Euro OTC	Calcium citrate …	1701001	22995	40	20170124*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 200 spectra of 5 reference samples from the substance/substance group *Calcium citrate tetrahydrate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 5 different batches.

- 72 233 spectra from a total of 1577 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 290 spectra from 8 reference samples of the substance/substance group *Calcium citrate tetrahydrate*.

- These include spectra of independent samples from 5 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Calcium citrate tetrahydrate	90034189	20013	60
Caelo	Calcium citrate tetrahydrate	13391203	21320	40
Euro OTC	Calcium citrate tetrahydrate	1509039	21931†	20
Euro OTC	Calcium citrate tetrahydrate	1509039-01	22255†	20
Euro OTC	Calcium citrate tetrahydrate	1606001	22681	40
Euro OTC	Calcium citrate tetrahydrate	1707025	23606	40
Caelo	Calcium citrate tetrahydrate	171768	23651	30
Euro OTC	Calcium citrate tetrahydrate	1803031	24077	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 783 spectra from a total of 3491 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 192 spectra from 77 *Apo-Ident* customers from 91 batches from the substance/substance group *Calcium citrate tetrahydrate*.

- These include spectra of independent samples from 86 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Calcium citrate tetrahydrate		3
Euro OTC	Calcium citrate tetrahydrate	1402003-01	3
GEHE	Calcium citrate tetrahydrate	21022141/3	1
Euro OTC	Calcium citrate tetrahydrate	1509039-02	6
Caelo	Calcium citrate tetrahydrate	15177702	2
Caelo	Calcium citrate tetrahydrate	50/6	1
Caelo	Calcium citrate tetrahydrate	13391203	4
Caelo	Calcium citrate tetrahydrate	15375703	1
Caelo	Calcium citrate tetrahydrate	11349325	2
Caelo	Calcium citrate tetrahydrate	11168806	5
Caelo	Calcium citrate tetrahydrate	13391205	5
Euro OTC	Calcium citrate tetrahydrate	1408017-01	3
Caelo	Calcium citrate tetrahydrate	12310418	3
Caelo	Calcium citrate tetrahydrate	11061402	1
Euro OTC	Calcium citrate tetrahydrate	1305018-01	5
Euro OTC	Calcium citrate tetrahydrate	1305018-02	1
Caelo	Calcium citrate tetrahydrate	130501801	2
Alliance Health 23.10.2...	Calcium citrate tetrahydrate	1402003-01	1
Euro OTC	Calcium citrate tetrahydrate	14020031	1
Euro OTC	Calcium citrate tetrahydrate	140801701	1
Caelo	Calcium citrate tetrahydrate	1408017-01	1
Caelo	Calcium citrate tetrahydrate	14133307	1
Gehe Kassel	Calcium citrate tetrahydrate	14133307	1
Caelo	Calcium citrate tetrahydrate	14133303	1
Caelo	Calcium citrate tetrahydrate	14133310	1
Euro OTC	Calcium citrate tetrahydrate	1502012-01	1
Euro OTC	Calcium citrate tetrahydrate	1502012-02	1
EuRho	Calcium citrate tetrahydrate	1502012-02	1
Euro OTC	Calcium citrate tetrahydrate	1502021-02	1
Euro OTC	Calcium citrate tetrahydrate	1502012-2	1
Caelo	Calcium citrate tetrahydrate	1509039-01	2
Euro OTC	Calcium citrate tetrahydrate	1509039-01	2
Noweda	Calcium citrate tetrahydrate	1509039-01	1
Caelo	Calcium citrate tetrahydrate	15177701	1
Caelo	Calcium citrate tetrahydrate	1509039-02	1
Caelo	Calcium citrate tetrahydrate	15177703	7
Euro OTC	Calcium citrate tetrahydrate	15177704	1
Caelo	Calcium citrate tetrahydrate	15375713	5

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Supplier	Substance	Batch	Spectra
Caelo	Calcium citrate tetrahydrate	15375712	2
Caelo	Calcium citrate tetrahydrate	15375702	2
Caelo	Calcium citrate tetrahydrate	15375707	1
Caelo	Calcium citrate tetrahydrate	16056501	1
Caelo	Calcium citrate tetrahydrate	16021502	1
Caelo	Calcium citrate tetrahydrate	16056504	4
Caelo	Calcium citrate tetrahydrate	16056505	1
Caelo	Calcium citrate tetrahydrate	16056510	2
Euro OTC	Calcium citrate tetrahydrate	1606001-01	1
Euro OTC	Calcium citrate tetrahydrate	1606001-02	1
Euro OTC	Calcium citrate tetrahydrate	3006222	1
Euro OTC	Calcium citrate tetrahydrate	1710007-01	1
Euro OTC	Calcium citrate tetrahydrate	1701001-01	1
Euro OTC	Calcium citrate tetrahydrate	1040896	1
Caelo	Calcium citrate tetrahydrate	17176806	1
Fagron	Calcium citrate tetrahydrate	413031/2	1
Klenk	Calcium citrate tetrahydrate	1107012-02	3
Caelo	Calcium citrate tetrahydrate	3512U-01209	1
Caelo	Calcium citrate tetrahydrate	2114M1209	1
Euro OTC	Calcium citrate tetrahydrate	1107012-01	1
ACM	Calcium citrate tetrahydrate	KNC0740J15	1
Euro OTC	Calcium citrate tetrahydrate	1107012-02	1
Caelo	Calcium citrate tetrahydrate	11349304	2
Caelo	Calcium citrate tetrahydrate	11349309	2
Caelo	Calcium citrate tetrahydrate	11168813	1
Euro OTC	Calcium citrate tetrahydrate	1058904	1
Euro OTC	Calcium citrate tetrahydrate	1111036-01	3
Phönix	Calcium citrate tetrahydrate	1207006-01	3
Euro OTC	Calcium citrate tetrahydrate	1009030-01	1
Euro OTC	Calcium citrate tetrahydrate	1207006-01	4
Phönix	Calcium citrate tetrahydrate	1111036-01	2
Euro OTC	Calcium citrate tetrahydrate	1211007-01	5
Sanacorp	Calcium citrate tetrahydrate	1211007-01	1
Caelo	Calcium citrate tetrahydrate	121100701	1
EuRho/Jenne	Calcium citrate tetrahydrate	1211007-01	1
Caelo	Calcium citrate tetrahydrate	12310401	2
Caelo	Calcium citrate tetrahydrate	12310407	2
Caelo	Calcium citrate tetrahydrate	12310413	4
Euro OTC	Calcium citrate tetrahydrate	13031204	1
Phönix	Calcium citrate tetrahydrate	1305018-01	1
Noweda/Hedinger	Calcium citrate tetrahydrate	1305018-02	2
Fagron	Calcium citrate tetrahydrate	13d16-n06	1
Caelo	Calcium citrate tetrahydrate	92192429	1
Caelo	Calcium citrate tetrahydrate	92457399	1
Sanacorp	Calcium citrate tetrahydrate	111103601	1
Caelo	Calcium citrate tetrahydrate	11349301	1
Caelo	Calcium citrate tetrahydrate	11168803	1
Noweda	Calcium citrate tetrahydrate	11349309	1
Post-Apotheke	Calcium citrate tetrahydrate	11349313	1
Caelo	Calcium citrate tetrahydrate	11349318	4
Caelo	Calcium citrate tetrahydrate	11349313	2
Caelo	Calcium citrate tetrahydrate	11349315	1
Caelo	Calcium citrate tetrahydrate	11349320	1
Phönix 07.03.13	Calcium citrate tetrahydrate	11349325	1
Elementar	Calcium citrate tetrahydrate	11602007228939	1
Caelo	Calcium citrate tetrahydrate	1168806	1
Caelo	Calcium citrate tetrahydrate	1168813	1
Gehe 12.04.2013	Calcium citrate tetrahydrate	11K04-N09	1
Cealo	Calcium citrate tetrahydrate	12310401	1
Caelo	Calcium citrate tetrahydrate	12310402	2

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Supplier	Substance	Batch	Spectra
Caelo	Calcium citrate tetrahydrate	12310403	3
Caelo	Calcium citrate tetrahydrate	12310406	5
Caelo	Calcium citrate tetrahydrate	12310411	2
Caelo	Calcium citrate tetrahydrate	12310417	3
Caelo	Calcium citrate tetrahydrate	71356168	1
Caelo	Calcium citrate tetrahydrate	133912042x	1
Caelo	Calcium citrate tetrahydrate	19061315	1
Fagron	Calcium citrate tetrahydrate	13D16-N06	1
Jungbunzlauer	Calcium citrate tetrahydrate	2012290954	1

- 76 967 spectra from 463 *Apo-Ident* customers from a total of 25 459 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Calcium citrate tetrahydrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Calcium citrate tetrahydrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	186	14	72 233
Type B	0	281	9	161 783
Type C	0	171	21	76 967

The substance/substance group *Calcium citrate tetrahydrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	93.0000 % (> 91.5000 %)
Type B	100.0000 % (> 99.9928 %)	96.8966 % (> 95.8621 %)
Type C	100.0000 % (> 99.8850 %)	89.0625 % (> 87.5000 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21249	21931	3.66	54.40
21486	22995	5.74	43.60
21931	21931	0.00	53.59
22255	21931	3.09	52.81
22995	22995	0.00	49.81

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Calcium gluconate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20871-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Calcium gluconate; Calcii gluconas; Calcii gluconicum

Special notes

When selecting the *Calcium gluconate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Calcium gluconate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Calcium gluconate	12236502	20871	40	1401575
Euro OTC	Calcium gluconate	1304012-01	21283	40	AR-15-FG-008127-01
Caelo	Calcium gluconate	12335829	21312	40	20121121
Euro OTC	Calcium gluconate	1407041-01	21821	40	20140818

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 4 reference samples from the substance/substance group *Calcium gluconate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 4 different batches.

- 72 273 spectra from a total of 1578 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 220 spectra from 6 reference samples of the substance/substance group *Calcium gluconate*.

- These include spectra of independent samples from 5 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Calcium gluconate	1005044-01	20270	40
Euro OTC	Calcium gluconate	1407041-01	21821†	20
Euro OTC	Calcium gluconate	1606034	22699	40
Caelo	Calcium gluconate	154356	23360	40
Euro OTC	Calcium gluconate	1712007	23873	40
Caelo	Calcium gluconate	181010	24017	40

- 161 853 spectra from a total of 3493 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B*

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 103 spectra from 55 *Apo-Ident* customers from 47 batches from the substance/substance group *Calcium gluconate*.

- These include spectra of independent samples from 45 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Euro OTC	Calcium gluconate	1209006-01	12
Euro OTC	Calcium gluconate	1407041-01	3
EuRho	Calcium gluconate	12090006-01	1
Fagron	Calcium gluconate	12/13-N04	1
Euro OTC	Calcium gluconate	1304012-01	7
Euro/Gehe	Calcium gluconate	1304012-01	1
Euro OTC	Calcium gluconate	1304012-02	7
Euro OTC	Calcium gluconate	130401202	1
sanacorp	Calcium gluconate	1407041-01	1
Euro OTC	Calcium gluconate	140704101	1
Caelo	Calcium gluconate	1407041-01	1
Euro OTC	Calcium gluconate	1407041-02	10
Euro OTC	Calcium gluconate	140704102	1
Caelo	Calcium gluconate	1407041-02	1
Caelo	Calcium gluconate	140704102	1
Berkel AHK	Calcium gluconate	14085407	2
Fagron	Calcium gluconate	14D11-B04	1
Caelo	Calcium gluconate	14230706	1
Caelo	Calcium gluconate	15126301	2
Fagron	Calcium gluconate	14D11-B04-292997	1
Fagron	Calcium gluconate	14D11-B04-294136	1
Caelo	Calcium gluconate	15324806	1
Caelo	Calcium gluconate	15324810	1
Caelo	Calcium gluconate	15324807	1
Caelo	Calcium gluconate	15435601	1
Caelo	Calcium gluconate	15435607	1
Caelo	Calcium gluconate	15435620	2
Caelo	Calcium gluconate	15435619	1
Caelo	Calcium gluconate	15435611	1
Caelo	Calcium gluconate	15435622	2
Caelo	Calcium gluconate	1543601	1
Fagron	Calcium gluconate	15D13-B98-307445	1
Euro OTC	Calcium gluconate	1602001644	1
Euro OTC	Calcium gluconate	1606034-01	6
Phönix	Calcium gluconate	1606034-01	1
Euro OTC	Calcium gluconate	513-Q1211	1
Euro OTC	Calcium gluconate	Ch1407041-01	1
Euro OTC	Calcium gluconate	1105027	1
Gatt-Koller / Phoenix	Calcium gluconate	550/03141214	1
Fagron	Calcium gluconate	10G22-N12	1
Euro OTC	Calcium gluconate	1105027-01	3
Fagron	Calcium gluconate	1105027-02	1
Euro OTC	Calcium gluconate	1105027-02	3
Caelo	Calcium gluconate	11121607	1

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Supplier	Substance	Batch	Spectra
Euro OTC	Calcium gluconate	115027-01	1
Euro OTC	Calcium gluconate	1209006	1
gehe	Calcium gluconate	1209006-01	1
Eurho/Sns	Calcium gluconate	1209006-01	1
Caelo	Calcium gluconate	1235813	1
Caelo	Calcium gluconate	12335813	1
Caelo	Calcium gluconate	12335810	1
Fagron	Calcium gluconate	12D17-N01	1
Euro OTC	Calcium gluconate	20270912-1	1
Finze	Calcium gluconate	917857359	1
Euro OTC	Calcium gluconate	Ch1304012	1
Caelo	Calcium gluconate	14085405	1

- 77 056 spectra from 463 *Apo-Ident* customers from a total of 25 500 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Calcium gluconate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Calcium gluconate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	72 273
Type B	0	210	10	161 853
Type C	0	94	9	77 056

The substance/substance group *Calcium gluconate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9928 %)	95.4545 % (> 94.0909 %)
Type C	100.0000 % (> 99.8850 %)	91.2621 % (> 88.3495 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

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Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20871	20871	0.00	37.37
21283	21283	0.00	29.52
21312	20871	5.83	38.60
21821	21283	3.12	29.51

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Calcium glycerophosphate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20352-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Calcium glycerophosphate; Calcii glycerinophosphoricum; Calcii glycerophosphas

Special notes

When selecting the *Calcium glycerophosphate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Calcium glycerophosphate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Calcium glycerop…	12012417	20771	40	20120131
Fagron	Calcium glycerop…	13I17-N04	21234	40	20131016
Caelo	Calcium glycerop…	13007912	21311	40	20130124
Caelo	Calcium glycerop…	14341007	21969	40	AR-16-FG-005932-01
Fagron	Calcium glycerop…	15B03-B03-305050	21978	40	1706313

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 200 spectra of 5 reference samples from the substance/substance group *Calcium glycerophosphate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 5 different batches.

- 72 233 spectra from a total of 1577 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 360 spectra from 10 reference samples of the substance/substance group *Calcium glycerophosphate*.

- These include spectra of independent samples from 6 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Calcium glycerophosphate	11160607	20352	40
Caelo	Calcium glycerophosphate	12012403	20507	40
Caelo	Calcium glycerophosphate	12012411	20605	40
Caelo	Calcium glycerophosphate	12012405	20606	40
Caelo	Calcium glycerophosphate	12012411	20679	40
Caelo	Calcium glycerophosphate	12012417	20762	40
Caelo	Calcium glycerophosphate	12012413	20763	40
Caelo	Calcium glycerophosphate	14341007	21969†	20
Fagron	Calcium glycerophosphate	15B03-B03-305050	21978†	20
Caelo	Calcium glycerophosphate	162310	23361	40

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 713 spectra from a total of 3490 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 80 spectra from 44 *Apo-Ident* customers from 45 batches from the substance/substance group *Calcium glycerophosphate*.

- These include spectra of independent samples from 42 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Calcium glycerophosphate	13007914	2
Fagron	Calcium glycerophosphate	13/17-N04	2
Caelo	Calcium glycerophosphate	13007908	1
Caelo	Calcium glycerophosphate	13007912	3
Caelo	Calcium glycerophosphate	13007919	1
Fagron	Calcium glycerophosphate	1317-N04	2
Fagron	Calcium glycerophosphate	1314000019	1
Fagron	Calcium glycerophosphate	13A18N02	2
Caelo	Calcium glycerophosphate	13007922	1
Caelo	Calcium glycerophosphate	14341007	6
Caelo	Calcium glycerophosphate	1341001	1
Fagron	Calcium glycerophosphate	13A18-N02	5
Caelo	Calcium glycerophosphate	1431001	1
Caelo	Calcium glycerophosphate	14341009	2
Caelo	Calcium glycerophosphate	14341010	1
Caelo	Calcium glycerophosphate	14341012	2
Caelo	Calcium glycerophosphate	14341013	2
Caelo	Calcium glycerophosphate	14347101	2
Sanacorp	Calcium glycerophosphate	14341015	1
Caelo	Calcium glycerophosphate	14341015	1
Fagron	Calcium glycerophosphate	14B10B02	1
Fagron	Calcium glycerophosphate	14B10-B02	1
Fagron	Calcium glycerophosphate	14B10-B02-291642	2
Fagron	Calcium glycerophosphate	14B10-B02-296841	4
Caelo	Calcium glycerophosphate	14B10-B02-296841	1
Fagron	Calcium glycerophosphate	14B10-B02-296842	1
Fagron	Calcium glycerophosphate	15B03B03	1
Fagron	Calcium glycerophosphate	15B03-B03-305050	2
Fagron	Calcium glycerophosphate	15B03-B03	1
Caelo	Calcium glycerophosphate	15B03-B03-305050	1
Caelo	Calcium glycerophosphate	15B03B03305050	1
Caelo	Calcium glycerophosphate	16231001	2
Caelo	Calcium glycerophosphate	16231004	2
Caelo	Calcium glycerophosphate	16231007	2
Caelo	Calcium glycerophosphate	16231006	2
Caelo	Calcium glycerophosphate	301500	1
Fagron	Calcium glycerophosphate	3115A-01212	1
Caelo	Calcium glycerophosphate	16231005	1
Fagron	Calcium glycerophosphate	5212M-01212	1
Fagron	Calcium glycerophosphate	12/18-N06	2

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Supplier	Substance	Batch	Spectra
Fagron	Calcium glycerophosphate	11G19-N05	1
Fagron	Calcium glycerophosphate	12I18-N06	3
Caelo	Calcium glycerophosphate	13007902	1
Caelo	Calcium glycerophosphate	12012413	2
Caelo	Calcium glycerophosphate	12012406	1
Fagron	Calcium glycerophosphate	1216000005	1
Gatt-Koller/Kwizda	Calcium glycerophosphate	4007/09123812	1
Caelo	Calcium glycerophosphate	13A18-No2	1

- 77 079 spectra from 463 *Apo-Ident* customers from a total of 25 503 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Calcium glycerophosphate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Calcium glycerophosphate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	200	0	72 233
Type B	0	353	7	161 713
Type C	0	55	25	77 079

The substance/substance group *Calcium glycerophosphate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9928 %)	98.0556 % (> 97.2222 %)
Type C	100.0000 % (> 99.8850 %)	68.7500 % (> 65.0000 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

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Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20771	21969	15.89	33.24
21234	21969	3.35	31.09
21311	21969	4.08	30.68
21969	21969	0.00	31.66
21978	21978	0.00	35.18

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Calcium lactate pentahydrate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20745-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Calcium lactate pentahydrate; Calcii lactas pentahydricus; Calcii lacticum pentahydricum

Special notes

When selecting the *Calcium lactate pentahydrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Calcium lactate pentahydrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Calcium lactate …	12E10-N03	20745	40	20120704
Fagron	Calcium lactate …	12I12-N06	21232	40	AR-15-FG-007939-01
Caelo	Calcium lactate …	15101401	21909	40	20150407
Caelo	Calcium lactate …	15101405	22263	40	20150407
Caelo	Calcium lactate …	161313	22445	40	20160513*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 200 spectra of 5 reference samples from the substance/substance group *Calcium lactate pentahydrate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 5 different batches.

- 72 233 spectra from a total of 1577 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 220 spectra from 7 reference samples of the substance/substance group *Calcium lactate pentahydrate*.

- These include spectra of independent samples from 4 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Calcium lactate pentahydrate	`zu erfassen`	20516	40
Caelo	Calcium lactate pentahydrate	15101401	21909†	20
Caelo	Calcium lactate pentahydrate	15101405	22263†	20
Caelo	Calcium lactate pentahydrate	161313	22445†	20
Fagron	Calcium lactate pentahydrate	14H01-B05-323830	23566	40
Caelo	Calcium lactate pentahydrate	171377	23642	40
Caelo	Calcium lactate pentahydrate	180734	24035	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 853 spectra from a total of 3493 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 41 spectra from 18 *Apo-Ident* customers from 25 batches from the substance/substance group *Calcium lactate pentahydrate*.

- These include spectra of independent samples from 23 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Calcium lactate pentahydrate	11369606	1
Caelo	Calcium lactate pentahydrate	13080804	2
Caelo	Calcium lactate pentahydrate	13080805	2
Fagron	Calcium lactate pentahydrate	12I12-N06	2
Fagron	Calcium lactate pentahydrate	13L18-B04-295541	3
Phönix	Calcium lactate pentahydrate	14H01-B05	1
Fagron	Calcium lactate pentahydrate	13L18B04	1
Fagron	Calcium lactate pentahydrate	14H01-B05	1
Caelo	Calcium lactate pentahydrate	15101409	1
Caelo	Calcium lactate pentahydrate	14H01B05300502	1
phönix	Calcium lactate pentahydrate	15101411	1
Fargon/Sanacorp	Calcium lactate pentahydrate	14H01-B05	1
Caelo	Calcium lactate pentahydrate	15101411	2
Caelo	Calcium lactate pentahydrate	15227803	1
Caelo	Calcium lactate pentahydrate	15227804	2
Caelo	Calcium lactate pentahydrate	16131307	1
Caelo	Calcium lactate pentahydrate	11369610	1
Caelo	Calcium lactate pentahydrate	11369614	2
Caelo	Calcium lactate pentahydrate	11369618	1
Fagron	Calcium lactate pentahydrate	11126-N15	1
Fagron	Calcium lactate pentahydrate	12C15-N02	3
Fagron	Calcium lactate pentahydrate	12/12-N06	1
Krämer&Martin	Calcium lactate pentahydrate	11612009053019	1
Shop	Calcium lactate pentahydrate	1111001829	1
Caelo	Calcium lactate pentahydrate	12E10-N03	1
Fagron	Calcium lactate pentahydrate	12I12-N01	1
Caelo	Calcium lactate pentahydrate	12C15-N02	2
Caelo	Calcium lactate pentahydrate	13080802	2
Stockmeier Food	Calcium lactate pentahydrate	2012331885	1

- 77 118 spectra from 463 *Apo-Ident* customers from a total of 25 523 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Calcium lactate pentahydrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Calcium lactate pentahydrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	200	0	72 233
Type B	0	220	0	161 853
Type C	0	40	1	77 118

The substance/substance group *Calcium lactate pentahydrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 97.2727 %)
Type C	100.0000 % (> 99.8850 %)	97.5610 % (> 90.2439 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20745	21232	7.14	49.98
21232	21232	0.00	46.48
21909	21232	3.58	48.84
22263	21232	7.55	46.07
22445	22445	0.00	50.25

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Calcium orotate dihydrate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20418-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Calcium orotate dihydrate; Calcii orotas; Calcii oroticum

Special notes

When selecting the *Calcium orotate dihydrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Calcium orotate dihydrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Calcium orotate ...	12L04-N07	20824	40	20121207
Fagron	Calcium orotate ...	13J23-N05	21227	40	20131111
Euro OTC	Calcium orotate ...	1401006-01	21245	40	1412540
Euro OTC	Calcium orotate ...	1603003	22520	40	20160329*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 4 reference samples from the substance/substance group *Calcium orotate dihydrate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 4 different batches.

- 72 273 spectra from a total of 1578 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 200 spectra from 5 reference samples of the substance/substance group *Calcium orotate dihydrate*.

- These include spectra of independent samples from 4 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Pharmorgana	Calcium orotate dihydrate	1000139407	20418	40
Euro OTC	Calcium orotate dihydrate	1009035-01	20535	40
Euro OTC	Calcium orotate dihydrate	1009035-01	20814	40
Euro OTC	Calcium orotate dihydrate	1411003	22519	40
Fagron	Calcium orotate dihydrate	16F13-B04-324144	23574	40

- 161 873 spectra from a total of 3495 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 8 spectra from 3 *Apo-Ident* customers from 6 batches from the substance/substance group *Calcium orotate dihydrate*.

- These include spectra of independent samples from 5 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Euro OTC	Calcium orotate dihydrate	1009035-01	2
Microsin Pharmorgana	Calcium orotate dihydrate	ORC00413	1
Euro OTC	Calcium orotate dihydrate	1203037-01	2
Euro OTC	Calcium orotate dihydrate	1401006-01	1
Pharmorgana	Calcium orotate dihydrate	ORC00113	1
Pharmorgana	Calcium orotate dihydrate	ORC00213	1

- 77 151 spectra from 463 *Apo-Ident* customers from a total of 25 541 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Calcium orotate dihydrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Calcium orotate dihydrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	72 273
Type B	0	104	96	161 873
Type C	0	8	0	77 151

The substance/substance group *Calcium orotate dihydrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9928 %)	52.0000 % (> 50.5000 %)
Type C	100.0000 % (> 99.8851 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several

new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20824	21245	4.98	63.84
21227	21245	2.44	64.31
21245	21245	0.00	64.09
22520	22520	0.00	63.60

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Calcium pantothenate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20395-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Calcium pantothenate; Calcii panthothenas; Calcii panthothenicum

Special notes

When selecting the *Calcium pantothenate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Calcium pantothenate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Calcium pantothe…	13H28-N11	21233	40	20130916
Euro OTC	Calcium pantothe…	1305034-01	21243	40	20130617
Caelo	Calcium pantothe…	14208012	21765	40	20140722
Euro OTC	Calcium pantothe…	1509024	21901	40	20151005*
Euro OTC	Calcium pantothe…	1603042	22551	40	20160429*

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Calcium pantothe…	1607023	22691	40	20160809*
Euro OTC	Calcium pantothe…	1702018	23153	40	20170330*
Euro OTC	Calcium pantothe…	1711003	23890	40	20171123*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 320 spectra of 8 reference samples from the substance/substance group *Calcium pantothenate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 8 different batches.

- 72 113 spectra from a total of 1574 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 280 spectra from 8 reference samples of the substance/substance group *Calcium pantothenate*.

- These include spectra of independent samples from 6 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Calcium pantothenate	11J20-N01	20395	40
Fagron	Calcium pantothenate	10I22-N05	20444	40
Caelo	Calcium pantothenate	14208012	21765†	20
Euro OTC	Calcium pantothenate	1509024	21901†	20
Caelo	Calcium pantothenate	162516	23363	40
Caelo	Calcium pantothenate	15344217	23717	40
Caelo	Calcium pantothenate	173352	24045	40
Euro OTC	Calcium pantothenate	1803014	24081	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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- 161 793 spectra from a total of 3491 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 70 spectra from 36 *Apo-Ident* customers from 42 batches from the substance/substance group *Calcium pantothenate*.

- These include spectra of independent samples from 39 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Calcium pantothenate	15143914	1
Caelo	Calcium pantothenate	14208004	1
Caelo	Calcium pantothenate	12340832	1
Fagron	Calcium pantothenate	13H28N11	1
Caelo	Calcium pantothenate	12340846	1
Fagron	Calcium pantothenate	13H28-N11	1
Fagron	Calcium pantothenate	14G02-B10-301624	1
Fagron	Calcium pantothenate	14G02-B10-297373	1
Euroo/Anzag	Calcium pantothenate	1509024-01	2
Caelo	Calcium pantothenate	11105731	1
Fagron	Calcium pantothenate	1111110405	1
Caelo	Calcium pantothenate	12340809	1
Fagron	Calcium pantothenate	11L20-N11	1
Fagron	Calcium pantothenate	12G05-N12	1
Caelo	Calcium pantothenate	12340808	3
Fagron	Calcium pantothenate	13B22-N01	1
Euro OTC	Calcium pantothenate	5121405	1
Caelo	Calcium pantothenate	8041407	1
Euro OTC	Calcium pantothenate	10021505	1
Caelo	Calcium pantothenate	12340859	1
Euro OTC	Calcium pantothenate	1209022-02	2
Euro OTC	Calcium pantothenate	1410011-01	1
Euro OTC	Calcium pantothenate	1305034-01	4
Euro OTC	Calcium pantothenate	130503401	2
Euro OTC	Calcium pantothenate	1312027-01	3
Euro OTC	Calcium pantothenate	1410011-02	4
Caelo	Calcium pantothenate	1410011-01	1
Caelo	Calcium pantothenate	1410011-02	1
Euro OTC	Calcium pantothenate	1509024-01	4
Fagron	Calcium pantothenate	14G02-B10	1
Noweda	Calcium pantothenate	14208012	1
Caelo	Calcium pantothenate	1509024-01	1
Gehe	Calcium pantothenate	1004024-01	1
Euro OTC	Calcium pantothenate	1603042-01	3
Caelo	Calcium pantothenate	1607023-01	2

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[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Supplier	Substance	Batch	Spectra
Euro OTC	Calcium pantothenate	1111025-01	3
Caelo	Calcium pantothenate	1013Q-03022	1
Fagron	Calcium pantothenate	1111025-01	1
Daiichi	Calcium pantothenate	1209022-01	1
Euro OTC	Calcium pantothenate	1209022-01	1
Euro OTC	Calcium pantothenate	120902202	1
Caelo	Calcium pantothenate	12236622	1
Euro OTC	Calcium pantothenate	1209022-02pzn	1
Caelo	Calcium pantothenate	27111303	1
Caelo	Calcium pantothenate	12340819	2
Fagron	Calcium pantothenate	12F19-N07	1
Euro OTC	Calcium pantothenate	17021401	1
Gatt-Koller / Phoenix	Calcium pantothenate	3783/09112912	1

- 77 089 spectra from 463 *Apo-Ident* customers from a total of 25 506 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Calcium pantothenate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Calcium pantothenate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	320	0	72 113
Type B	0	280	0	161 793
Type C	0	69	1	77 089

The substance/substance group *Calcium pantothenate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9887 %)	100.0000 % (> 98.1250 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 97.8571 %)
Type C	100.0000 % (> 99.8850 %)	98.5714 % (> 94.2857 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

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Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21233	23153	5.88	17.76
21243	23153	10.03	16.45
21765	23153	10.19	17.28
21901	21901	0.00	22.79
22551	22551	0.00	14.76
22691	22691	0.00	14.35
23153	23153	0.00	18.20
23890	23890	0.00	18.59

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Camphor**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20028-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Camphor; Camphora

Special notes

When selecting the *Camphor* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Camphor*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Camphor	1406029-01	21599	40	20140708
Fagron	Camphor	14E19-B07-300365	22256	40	20140527
Caelo	Camphor	15316801	22279	40	20151029
Caelo	Camphor	162354	23065	40	20160809*
Caelo	Camphor	170043	23310	40	20170220*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 200 spectra of 5 reference samples from the substance/substance group *Camphor*. These samples are listed above in the section *calibration samples*. The reference samples originate from 5 different batches.

- 72 233 spectra from a total of 1577 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 370 spectra from 11 reference samples of the substance/substance group *Camphor*.

- These include spectra of independent samples from 8 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Camphor	82383109	20028	30
Euro OTC	Camphor	2906016-02	20189	40
Caelo	Camphor	11074503	20287	40
Euro OTC	Camphor	1106007-02	20328	40
Euro OTC	Camphor	1406029-01	21599†	20
Fagron	Camphor	14E19-B07-300365	22256†	20
Caelo	Camphor	15316801	22279†	20
Caelo	Camphor	16209309	23408	40
Fagron	Camphor	16E23-B08-336937	23589	40
Caelo	Camphor	172883	23804	40
Caelo	Camphor	180198	24013	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*).

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- 161 703 spectra from a total of 3488 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 383 spectra from 189 *Apo-Ident* customers from 174 batches from the substance/substance group *Camphor*.

- These include spectra of independent samples from 171 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Camphor	3091203	1
Euro OTC	Camphor	113Q-01221	1
Caelo	Camphor	312M-01219	1
Caelo	Camphor	315E-01221	1
Klenk	Camphor	444A100826	1
Caelo	Camphor	4031503	1
Klenk	Camphor	444A160817	3
Caelo	Camphor	4101303	1
phönix	Camphor	444a160817	1
Klenk	Camphor	444A140526	2
Sanacorp	Camphor	444A130115	1
xxx	Camphor	709E-01221	1
Caelo	Camphor	713A-01221	1
Caelo	Camphor	1087	1
Fagron	Camphor	8082014A	1
Caesar/Noweda	Camphor	1032	1
Euro OTC	Camphor	1101029-02/Ch241011	1
Post-Apotheke 22.01.2013	Camphor	11032012	1
Caesar & Loretz GmbH, 4...	Camphor	11032035	1
sanacorp	Camphor	11074501	1
Caelo	Camphor	11286905	5
Caelo	Camphor	11032035	3
Sanacorp	Camphor	11032035	1
Fagron	Camphor	11H30-N15	2
Caelo	Camphor	11286909	2
Caelo	Camphor	11286910	1
Fagron	Camphor	11K23-N04	1
Noweda	Camphor	1202021-01	1
Euro OTC	Camphor	1202021	1
Euro OTC	Camphor	1202021-01	4
Anzag ek:8.85EUR 23.08.12	Camphor	1202021-01	1
Phönix	Camphor	1202021-02	1
Euro OTC	Camphor	1202021-02	1
Caelo	Camphor	12054105	1
Anzag 17.06.2013	Camphor	1202021-02	1
Caelo	Camphor	12054107	5

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Hence, these spectra are not independent and are not of *Type B*.

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Supplier	Substance	Batch	Spectra
Caelo	Camphor	12054113	1
Caelo	Camphor	12054114	3
Caelo	Camphor	12054124	3
Caelo	Camphor	12054141	6
Caelo	Camphor	12054142	6
Caelo	Camphor	12054143	1
Caelo	Camphor	12054149	7
Sanacorp	Camphor	12054149	1
Caeöo	Camphor	12054149	1
Caelo	Camphor	12054151	2
Caelo	Camphor	120564113	1
Caelo	Camphor	12061411	1
Euro OTC	Camphor	1210030-01	9
EuRho	Camphor	1210030-01	2
Gehe	Camphor	1210030-01	1
Euro OTC	Camphor	121003001	1
Caelo	Camphor	1210030-02	1
Euro OTC	Camphor	1210030-02	5
Großhandel	Camphor	1210030-02	1
Caelo	Camphor	12228206	1
Caelo	Camphor	12344905	6
Caelo	Camphor	12228205	1
Caelo	Camphor	12243701	1
	Camphor	12344909	1
Fagron	Camphor	12B14-N09	1
Fagron	Camphor	12D23-N03	2
Fagron	Camphor	12G02-N09	3
Euro OTC	Camphor	1303013-01	6
Bombastus	Camphor	1303013-01	1
Euro OTC	Camphor	1303013-02	10
Großhandel	Camphor	1303013-02	2
euroct/gehe	Camphor	1303013-02	1
EuRho	Camphor	1303013-02	2
Euro OTC	Camphor	130313-02	1
Caelo	Camphor	13108106	2
Euro OTC	Camphor	1309019-02	1
Caelo	Camphor	13108114	2
Euro OTC	Camphor	1309019-03	1
Caelo	Camphor	1309019-03	1
Caelo	Camphor	13108110	1
Cealo/ Noweda	Camphor	13108116	1
Caelo	Camphor	13108118	1
Caelo	Camphor	13195301	3
Caelo	Camphor	13195314	7
Caelo	Camphor	13195316	6
Caelo	Camphor	13195318	1
Caelo	Camphor	13195320	2
Caelo	Camphor	13195322	7
Caelo	Camphor	13195326	3
Caelo	Camphor	13205501	2
Caelo	Camphor	13195328	1
Caelo	Camphor	13205502	1
Caelo	Camphor	13205508	1
Caelo	Camphor	13205511	3
Caelo	Camphor	13205512	2
Cae	Camphor	13205512	1
Caelo	Camphor	13205518	1
Caelo	Camphor	13205522	4
Caelo	Camphor	13205517	1
Fagron	Camphor	13H23-B04-288376	1

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Supplier	Substance	Batch	Spectra
Fagron	Camphor	13H23-B40-291888	1
Fagron	Camphor	13h23-b40-294116	1
Fagron	Camphor	13H23-B40-296252	1
Fagron	Camphor	13H23-B40-294116	1
Fagron	Camphor	13K28-B04	2
Phönix	Camphor	13K28-B04	1
Euro OTC	Camphor	1406029-01	1
Caelo	Camphor	1412023-01	3
Camphor & Allied Produc...	Camphor	1406029-01	1
Caelo	Camphor	13K28-04-294937	1
Euro OTC	Camphor	1406029-02	1
Euro OTC	Camphor	1412023-01	1
Fagron	Camphor	13K28-B04-294937	1
Fagron	Camphor	13K28-B04-289340	1
Caelo	Camphor	1410710	1
Caelo	Camphor	14202801	1
Caelo	Camphor	14224302	1
Caelo	Camphor	14202807	2
Phönix Gotha	Camphor	14202801	1
phönix	Camphor	14202801	1
Caelo	Camphor	14224303	4
Sanacorp	Camphor	14224303	1
Caelo	Camphor	14224304	1
Caelo	Camphor	14310703	1
Caelo	Camphor	14310109	1
Caelo	Camphor	14310705	13
Caelo	Camphor	14310709	4
Sanacorp	Camphor	14310709	1
Caelo	Camphor	14310710	1
Caelo	Camphor	14310713	5
Caelo	Camphor	14310715	1
Caelo	Camphor	14310718	4
Sanacorp	Camphor	14310720	2
Caesar&Loretz	Camphor	14310719	1
Caelo	Camphor	1480	2
Caelo	Camphor	14310722	1
Fagron	Camphor	14G23-B04	2
Fagron	Camphor	14G23-B04-299202	2
Fagron	Camphor	14G23-B04-301878	1
Caelo	Camphor		2
Caelo	Camphor	15062702	4
Fagron	Camphor	14G23-B04-301879	1
Fagron	Camphor	14G23-B04-296868	1
Fagron	Camphor	15/18-B11-321658	1
Calo/AHD	Camphor	15086803	1
Caelo	Camphor	15086801	1
Fagron	Camphor	15097801	1
Caelo	Camphor	15086806	1
Caelo	Camphor	15097803	2
Caelo	Camphor	15120902	1
Caelo	Camphor	15120901	2
Caesar & Loretz GmbH Hi...	Camphor	15316801	1
Caelo	Camphor	15316801	2
Caelo	Camphor	15316802	1
Caelo	Camphor	15316807	4
Caelo	Camphor	15316806	2
Phoenix	Camphor	15316811	1
Caelo	Camphor	15316811	4
Caelo	Camphor	15316815	5
Caelo	Camphor	15316812	1

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Supplier	Substance	Batch	Spectra
Caelo	Camphor	15316819	2
Caelo	Camphor	15320604	3
Caelo	Camphor	15397704	3
Caelo	Camphor	16209301	4
Caelo	Camphor	16209305	3
Caelo	Camphor	16209304	1
Camphor & Allied Produc…	Camphor	16209302	1
Gehe	Camphor	16209305	1
Caelo	Camphor	16209306	1
Caelo	Camphor	16209309	1
Caelo	Camphor	16235404	1
Caelo	Camphor	17004301	4
Fagron	Camphor	16E23-B08	1
Caelo	Camphor	17004302	2
Phoenix	Camphor	16235405	1
Caelo	Camphor	17050602	1
Caelo	Camphor	17004306	1
Caelo	Camphor	17050605	1
Caelo	Camphor	17050606	1
Gehe	Camphor	17134702	1
Caelo	Camphor	2344905	1
EuRho	Camphor	2111E-01219	1
Euro OTC	Camphor	2803020-01	2
Galke	Camphor	23624	1
Caelo	Camphor	5315I-01221	1
Fagron	Camphor	690442	1
Caelo	Camphor	25041401	1
Euro OTC	Camphor	821509	1
Caelo	Camphor	2811Q-01221	1
AHD, 30.10.2013	Camphor	747564	1
Fagron	Camphor	825653	1
Caelo	Camphor	914E-01221	1
Klenk	Camphor	444A150721	2
Gehe	Camphor	10L08-N06	1
Euro OTC	Camphor	1106007-02	1
Euro OTC	Camphor	1101029-02	1
Caelo	Camphor	1202021-01	2
GEHE	Camphor	12K17-N09	1
Fagron	Camphor	1309019-02	1
Caelo	Camphor	13195304	1
Caelo	Camphor	13195311	2
Fagron	Camphor	13K28B04294933	1
Caelo	Camphor	13195323	1
Caelo	Camphor	444A140526	1
Caelo	Camphor	444A100826	1
Caelo	Camphor	4444A150721	1
Caelo	Camphor	11032023	1
Caelo	Camphor	11032025	1
Caelo	Camphor	11074509	1
Caelo	Camphor	1210030-01	1
Caesar/Noweda	Camphor	13195328	1

- 76 776 spectra from 463 *Apo-Ident* customers from a total of 25 375 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

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Validation results

The validation runs checked whether the substance/substance group *Camphor* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Camphor* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	200	0	72 233
Type B	0	362	8	161 703
Type C	0	347	36	76 776

The substance/substance group *Camphor* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9928 %)	97.8378 % (> 97.0270 %)
Type C	100.0000 % (> 99.8849 %)	90.6005 % (> 89.8172 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21599	23065	8.45	48.83
22256	23310	17.97	47.44
22279	23065	5.00	47.83
23065	23065	0.00	49.40
23310	23310	0.00	48.72

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Cannabidiol**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	22416-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Cannabidiol

Special notes

When selecting the *Cannabidiol* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Cannabidiol*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
THC-Pharma GmbH	Cannabidiol	15-7221-80338	22412	40	1316Q-07806
THC-Pharma GmbH	Cannabidiol	15-7221-80338	22416	40	1316Q-07806
THC-Pharma GmbH	Cannabidiol	CBD-API17-003	23398	40	20170609
THC-Pharma GmbH	Cannabidiol	CBD-API16-003	23464	40	2017B-03911
THC-Pharma GmbH	Cannabidiol	CBDAPI1801	23929	40	20180209
THC-Pharma GmbH	Cannabidiol	15-7221-80338	22412SI	40	1316Q-07806
THC-Pharma GmbH	Cannabidiol	15-7221-80338	22416SI	40	1316Q-07806

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 280 spectra of 7 reference samples from the substance/substance group *Cannabidiol*. These samples are listed above in the section *calibration samples*. The reference samples originate from 4 different batches.

- 72 153 spectra from a total of 1578 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 711 spectra from 17 reference samples of the substance/substance group *Cannabidiol*.

- These include spectra of independent samples from 1 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
THC-Pharma GmbH	Cannabidiol	15-7221-80338	22412†	20
THC-Pharma GmbH	Cannabidiol	15-7221-80338	22413	60
THC-Pharma GmbH	Cannabidiol	15-7221-80338	22414	60
THC-Pharma GmbH	Cannabidiol	15-7221-80338	22415	60
THC-Pharma GmbH	Cannabidiol	15-7221-80338	22416†	20
THC-Pharma GmbH	Cannabidiol	CBD-API17-003	23399	40
THC-Pharma GmbH	Cannabidiol	CBD-API16-004	23465	40
THC-Pharma GmbH	Cannabidiol	15-7221-80338	22412SI†	20
THC-Pharma GmbH	Cannabidiol	15-7221-80338	22413SI	60
THC-Pharma GmbH	Cannabidiol	15-7221-80338	22414SI	60
THC-Pharma GmbH	Cannabidiol	15-7221-80338	22415SI	60
THC-Pharma GmbH	Cannabidiol	15-7221-80338	22416SI†	20
THC-Pharma GmbH	Cannabidiol	CBD-API17-003	23398SI	40
THC-Pharma GmbH	Cannabidiol	CBD-API17-003	23399SI	31
THC-Pharma GmbH	Cannabidiol	CBD-API16-003	23464SI	40
THC-Pharma GmbH	Cannabidiol	CBD-API16-004	23465SI	40
THC-Pharma GmbH	Cannabidiol	CBDAPI1801	23929SI	40

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- 161 362 spectra from a total of 3494 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 27 spectra from 4 *Apo-Ident* customers from 12 batches from the substance/substance group *Cannabidiol*.

- These include spectra of independent samples from 10 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
THC-Pharm	Cannabidiol		12
Caelo	Cannabidiol	110216-02	3
THC-Pharm	Cannabidiol	CBDAP/17-003	3
THC Pharm GmbH	Cannabidiol	CBD-API16-001	2
THC-Pharm	Cannabidiol	cbd-adi17-002	1
Fagron	Cannabidiol	CBD-API17-002	1
THC Pharm	Cannabidiol	CBD-API16-004	1
THC-Pharm	Cannabidiol	CBD-API17-004	1
THC Pharm GmbH / THC Ph...	Cannabidiol	CBD-API17-005	1
THC-Pharm	Cannabidiol	CBD-API17-005	1
THC Pharm	Cannabidiol	H150218-1	1

- 77 132 spectra from 463 *Apo-Ident* customers from a total of 25 535 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Cannabidiol* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Cannabidiol* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	280	0	72 153
Type B	0	710	1	161 362
Type C	0	26	1	77 132

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

The substance/substance group *Cannabidiol* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.8571 %)
Type B	100.0000 % (> 99.9928 %)	99.8594 % (> 99.4374 %)
Type C	100.0000 % (> 99.8850 %)	96.2963 % (> 85.1852 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
22412	22412	0.00	84.08
22416	22416	0.00	85.33
23398	22412	9.80	82.38
23464	23464	0.00	81.68
23929	22416	16.31	82.52

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Capsaicin, natural**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20854-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Capsaicin, natural; Capsaicinoida

Special notes

When selecting the *Capsaicin, natural* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Capsaicin, natural*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Capsaicin, natural	13D12-N01	20854	40	1411392
Fagron	Capsaicin, natural	13J07-N07	21340	40	AR-15-FG-007151-01
Euro OTC	Capsaicin, natural	1703023	23145	40	20170407*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Capsaicin, natural*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 150 spectra from 4 reference samples of the substance/substance group *Capsaicin, natural*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Capsaicin, natural	118066-04	21638	60
Euro OTC	Capsaicin, natural	1603005-01	22930	40
Euro OTC	Capsaicin, natural	1603005-01	22931	40
Euro OTC	Capsaicin, natural	1603005-01	not required	10

- 161 923 spectra from a total of 3497 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 6 spectra from 4 *Apo-Ident* customers from 4 batches from the substance/substance group *Capsaicin, natural*.

- These include spectra of independent samples from 4 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Euro OTC	Capsaicin, natural	1603005-01	2
Euro OTC	Capsaicin, natural	1401043-02	2
Fagron	Capsaicin, natural	CP-12003	1
EuRho	Capsaicin, natural	1703023-02	1

- 77 153 spectra from 463 *Apo-Ident* customers from a total of 25 543 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Capsaicin, natural* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Capsaicin, natural* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	134	16	161 923
Type C	0	5	1	77 153

The substance/substance group *Capsaicin, natural* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	89.3333 % (> 87.3333 %)
Type C	100.0000 % (> 99.8852 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20854	20854	0.00	17.85
21340	21340	0.00	18.80
23145	23145	0.00	17.24

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Captopril**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20890-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Captopril; Captoprilum

Special notes

When selecting the *Captopril* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Captopril*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Captopril	12G25-N08	20890	40	20120814
Caelo	Captopril	12339610	21064	40	1403227
Caelo	Captopril	15189502	21874	40	AR-15-FG-014855-01
Fagron	Captopril	14B26-B01-312221	21921	40	20140317

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 4 reference samples from the substance/substance group *Captopril*. These samples are listed above in the section *calibration samples*. The reference samples originate from 4 different batches.

- 72 273 spectra from a total of 1578 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 340 spectra from 9 reference samples of the substance/substance group *Captopril*.

- These include spectra of independent samples from 4 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Captopril	10L09-N17	20255	30
Caelo	Captopril	15189502	21874†	20
Fagron	Captopril	14B26-B01-312221	21921†	20
Caelo	Captopril	170772	23366	40
Fagron	Captopril	17G21-B02-337989	23588	30
Caelo	Captopril	172102	23676	40
Caelo	Captopril	15189502	21874SI	60
Fagron	Captopril	14B26-B01-312221	21921SI	60
Caelo	Captopril	170772	23366SI	40

- 161 733 spectra from a total of 3493 batches from further 863 substances. These spectra were

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 154 spectra from 59 *Apo-Ident* customers from 63 batches from the substance/substance group *Captopril*.

- These include spectra of independent samples from 59 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Captopril	80616-6	1
Caelo	Captopril	12339616	2
Caelo	Captopril	12339602	1
Caelo	Captopril	12339604	2
Caelo	Captopril	12339605	4
Caelo	Captopril	12339607	1
Caelo	Captopril	12339606	1
Caelo	Captopril	12339611	2
AHD, 24.09.2013	Captopril	12339608	1
Caelo	Captopril	12339610	2
Herstellung	Captopril	12339607	1
Caelo	Captopril	12339618	1
Cealo/Sanacorp	Captopril	12339617	1
Caelo	Captopril	12339619	1
Caelo	Captopril	12F29-N04	1
Fagron	Captopril	12G25-N08	9
Caelo	Captopril	12G25-N08	2
Fagron	Captopril	12K16-N04	1
Caelo	Captopril	14196901	1
Caelo	Captopril	14196902	1
Caelo	Captopril	14196903	2
Fagron	Captopril	12J09-N09	1
Fagron	Captopril	12K-16N04	1
Fagron	Captopril	14196902	1
Caelo	Captopril	14196904	7
Caelo	Captopril	14196905	4
Caelo	Captopril	14196906	1
Fagron	Captopril	14B26-B01	6
Phonix	Captopril	14B26-B01	1
Fagron	Captopril	14B26-B012911557	1
Caelo	Captopril	14B26-B01-291555	1
Fagron	Captopril	14B26B01	1
Fagron	Captopril	14B26-B01-291555	4
Fagron	Captopril	14B26-B01-291557	7
Fagron	Captopril	14B26-B01-291556	1
Sonnenberg-Apotheke	Captopril	14B26-B01-291557	2
Fagron	Captopril	14B26-B01-302338	3
Caelo	Captopril	14B26-B01-291557	1
Fagron	Captopril	14B26-B01-310127	2
Fagrron	Captopril	14B26-B01-310127	2
Fagron	Captopril	14B26-B01-302337	1
Fagron	Captopril	14B26-B01-312221	2

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Supplier	Substance	Batch	Spectra
Caelo	Captopril	14B26-B01-310127	1
Fagron	Captopril	14B26-B01-316257	1
Fagron	Captopril	14B26-B01-314460	1
Hedinger	Captopril	14B26-B40	2
Fagron	Captopril	14B26-B40-318894	5
Fargon/Sanacorp	Captopril	14B26-B40-318894	1
Fagron	Captopril	14B26-B40-320183	3
Fagron	Captopril	14B26-B40-321319	3
Changzhou Pharmaceutical	Captopril	14B26-B40-321319	1
Caelo	Captopril	14B26-B40-320183	1
Fagron	Captopril	14B26-B40-323267	2
Caelo	Captopril	14B26-B40-323267	1
Caelo	Captopril	14B26-B01-310127	1
Caelo	Captopril	14B26-B40-325275	2
Fagron	Captopril	14B26-B40-325275	1
Caelo	Captopril	15189501	3
Fagron	Captopril	14B26-W0129-1557	1
Caelo	Captopril	15189502	2
Euro OTC	Captopril	15189507	3
Caelo	Captopril	15189509	2
Caelo	Captopril	15189503	1
Caelo	Captopril	15189510	2
Caelo	Captopril	15189511	4
Caelo	Captopril	15189514	5
Caelo	Captopril	15189512	1
Caelo	Captopril	15189517	2
Caelo	Captopril	15189525	1
Caelo	Captopril	15189521	2
Caelo	Captopril	17077202	2
Caelo	Captopril	17077208	1
Caelo	Captopril	17077205	1
Fagron	Captopril	17G27-B02-337989	1
Fagron	Captopril	EC140101	3
Caelo	Captopril	5102-14-042	1
Caelo	Captopril	14B26-B40	1
Fagron	Captopril	14b26-B01-291555	1

- 77 005 spectra from 463 *Apo-Ident* customers from a total of 25 485 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Captopril* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Captopril* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	160	0	72 273
Type B	0	239	101	161 733
Type C	0	141	13	77 005

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The substance/substance group *Captopril* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9928 %)	70.2941 % (> 69.4118 %)
Type C	100.0000 % (> 99.8850 %)	91.5584 % (> 89.6104 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20890	21064	5.85	44.58
21064	21064	0.00	46.75
21874	21874	0.00	55.25
21921	21874	12.30	52.48

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Carbomers 35000 / 50000**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20548-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Carbomers 35000 / 50000

Special notes

When selecting the *Carbomers 35000 / 50000* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Carbomers 35000 / 50000*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Carbomers 35000 …	13135601	20978	40	1403767
Caelo	Carbomers 35000 …	13186207	20979	40	1403768
Caelo	Carbomers 35000 …	14057902	21354	40	20140228
Euro OTC	Carbomers 35000 …	1311027-02	21561	40	20131205
Euro OTC	Carbomers 35000 …	1512010	22250	40	20151216*

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Carbomers 35000 …	1604032	22548	40	20160428*
Euro OTC	Carbomers 35000 …	1607028	22686	40	20160804*
Caelo	Carbomers 35000 …	162530	22759	40	20161011*
Euro OTC	Carbomers 35000 …	1610024	22852	40	20161102*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 360 spectra of 9 reference samples from the substance/substance group *Carbomers 35000 / 50000*. These samples are listed above in the section *calibration samples*. The reference samples originate from 9 different batches.

- 72 073 spectra from a total of 1573 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 420 spectra from 11 reference samples of the substance/substance group *Carbomers 35000 / 50000*.

- These include spectra of independent samples from 9 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Carbomers 35000 / 50000	11351507	20548	40
Caelo	Carbomers 35000 / 50000	11351604	20550	40
Caelo	Carbomers 35000 / 50000	11351611	20561	40
Caelo	Carbomers 35000 / 50000	14057903	21557	60

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*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Carbomers 35000 / 50000	1311027-02	21561†	20
Euro OTC	Carbomers 35000 / 50000	1512010	22250†	20
Euro OTC	Carbomers 35000 / 50000	1702012	23139	40
Euro OTC	Carbomers 35000 / 50000	1706015	23534	40
Caelo	Carbomers 35000 / 50000	172520	23621	40
Caelo	Carbomers 35000 / 50000	173614	23783	40
Euro OTC	Carbomers 35000 / 50000	1801044	23959	40

- 161 653 spectra from a total of 3488 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 268 spectra from 154 *Apo-Ident* customers from 85 batches from the substance/substance group *Carbomers 35000 / 50000*.

- These include spectra of independent samples from 82 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Euro OTC	Carbomers 35000 / 50000	12052014A	1
Euro OTC	Carbomers 35000 / 50000	101616773	1
Euro OTC	Carbomers 35000 / 50000	1210037-01	9
Caelo	Carbomers 35000 / 50000	12274907	8
Euro OTC	Carbomers 35000 / 50000	1305007-01	2
Euro OTC	Carbomers 35000 / 50000	1311027-02	6
Euro OTC	Carbomers 35000 / 50000	130800601	1
Euro OTC	Carbomers 35000 / 50000	1311027-01	3
Caelo	Carbomers 35000 / 50000	13194501	6
Caelo	Carbomers 35000 / 50000	13194503	8
Caelo	Carbomers 35000 / 50000	14016208	7
Caelo	Carbomers 35000 / 50000	1311027-02	1
Caelo	Carbomers 35000 / 50000	14057902	2
Euro OTC	Carbomers 35000 / 50000	1410001-01	12
Caelo	Carbomers 35000 / 50000	14057903	2
Caelo	Carbomers 35000 / 50000	14016209	3
Sanacorp	Carbomers 35000 / 50000	14149911	1
Euro OTC	Carbomers 35000 / 50000	141000101	1
Fischer/Gehe	Carbomers 35000 / 50000	1410001-02	1
EuRho	Carbomers 35000 / 50000	1410001-01	1
Caelo	Carbomers 35000 / 50000	15101802	6
Caelo	Carbomers 35000 / 50000	15015703	2
Caelo	Carbomers 35000 / 50000	15101801	4
Caelo	Carbomers 35000 / 50000	1410001-02	1

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†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Supplier	Substance	Batch	Spectra
Euro OTC	Carbomers 35000 / 50000	1512010-01	4
Caelo	Carbomers 35000 / 50000	15101810	5
Alliance H.	Carbomers 35000 / 50000	1512010-01	1
Caelo	Carbomers 35000 / 50000	15439003	10
Caelo	Carbomers 35000 / 50000	15439002	5
Euro OTC	Carbomers 35000 / 50000	1512010-02	3
Euro OTC	Carbomers 35000 / 50000	1604032-01	5
Euro/Phönix	Carbomers 35000 / 50000	161002401	1
Euro OTC	Carbomers 35000 / 50000	1610024-01	1
Euro OTC	Carbomers 35000 / 50000	1607028-01	3
Gehe	Carbomers 35000 / 50000	16237501	1
Caelo	Carbomers 35000 / 50000	16253004	5
Caelo	Carbomers 35000 / 50000	16253005	2
Caelo	Carbomers 35000 / 50000	16253009	5
Caelo	Carbomers 35000 / 50000	16253007	1
Caelo	Carbomers 35000 / 50000	16253014	1
Caelo	Carbomers 35000 / 50000	17146501	1
Caelo	Carbomers 35000 / 50000	2215M-01232	1
Caelo	Carbomers 35000 / 50000	1308006-01	1
Phoenix	Carbomers 35000 / 50000	1305007-01	1
Euro OTC	Carbomers 35000 / 50000	4311027-01	1
Sanacorp	Carbomers 35000 / 50000	1311027-01	1
Sanacorp	Carbomers 35000 / 50000	6/AKD13	1
Caelo	Carbomers 35000 / 50000	13194507	6
Caelo	Carbomers 35000 / 50000	13186207	4
Caelo	Carbomers 35000 / 50000	11351604	2
Caelo	Carbomers 35000 / 50000	11351605	2
Phoenix	Carbomers 35000 / 50000	13194505	1
Phoenix 25.07.2012	Carbomers 35000 / 50000	11351605	1
Caelo	Carbomers 35000 / 50000	11351618	4
Euro OTC	Carbomers 35000 / 50000	101217279	1
Euro OTC	Carbomers 35000 / 50000	1202020-01	2
EuRho	Carbomers 35000 / 50000	1210037-01	1
Gehe 01.07.2013	Carbomers 35000 / 50000	12274908	2
Caelo	Carbomers 35000 / 50000	12274912	5
Caelo	Carbomers 35000 / 50000	12274916	11
Caelo	Carbomers 35000 / 50000	12274910	3
Euro/Sanacorp	Carbomers 35000 / 50000	1305007-01	1
Caelo	Carbomers 35000 / 50000	12274922	1
Caelo	Carbomers 35000 / 50000	13186205	6
GEHE	Carbomers 35000 / 50000	11351616	1
Euro OTC	Carbomers 35000 / 50000	141000-01	1
Caelo	Carbomers 35000 / 50000	14310806	1
Caelo	Carbomers 35000 / 50000	15015709	2
Caelo	Carbomers 35000 / 50000	14149910	3
Caelo	Carbomers 35000 / 50000	15101807	1
Caelo	Carbomers 35000 / 50000	15101809	3
Caesar & Loretz GmbH Hi...	Carbomers 35000 / 50000	15101809	1
Caelo	Carbomers 35000 / 50000	1510801	1
Caelo	Carbomers 35000 / 50000	15257401	1
Sanacorp	Carbomers 35000 / 50000	1604032-01	1
Caelo	Carbomers 35000 / 50000	16237501	1
Caesar&Loretz,Phönix,06...	Carbomers 35000 / 50000	15439003	1
Caelo	Carbomers 35000 / 50000	16253002	1
Caelo	Carbomers 35000 / 50000	1623004	1
Caelo	Carbomers 35000 / 50000	16253012	1
Noweda	Carbomers 35000 / 50000	16253012	1
Phoenix 16.04.2014	Carbomers 35000 / 50000	13194503	1
Caelo	Carbomers 35000 / 50000	12274908	5
Caelo	Carbomers 35000 / 50000	13186203	3

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Supplier	Substance	Batch	Spectra
Caelo	Carbomers 35000 / 50000	13194512	1
Ichthyol/Phönix	Carbomers 35000 / 50000	14149905	1
Caelo	Carbomers 35000 / 50000	14149904	1
Sanacaorp	Carbomers 35000 / 50000	14149905	1
Caelo	Carbomers 35000 / 50000	14149906	3
Caelo	Carbomers 35000 / 50000	14149905	1
Caelo	Carbomers 35000 / 50000	14149911	1
Caelo	Carbomers 35000 / 50000	15015702	1
Caelo	Carbomers 35000 / 50000	11013605	2
Fagron	Carbomers 35000 / 50000	13194503	1
Gehe	Carbomers 35000 / 50000	13194505	1
Caelo	Carbomers 35000 / 50000	13194505	2
Caelo	Carbomers 35000 / 50000	13194511	1
Caelo	Carbomers 35000 / 50000	10157812	1
Caelo	Carbomers 35000 / 50000	11351601	1
Caelo	Carbomers 35000 / 50000	11013613	1
Caelo	Carbomers 35000 / 50000	11307511	1
Caelo	Carbomers 35000 / 50000	11351616	1
Erika apotheke	Carbomers 35000 / 50000	11351618	1
Caelo	Carbomers 35000 / 50000	11351623	1
Caelo	Carbomers 35000 / 50000	12274914	4
Hepart AG	Carbomers 35000 / 50000	12274916	1
Sanacorp	Carbomers 35000 / 50000	12274922	1
Caelo	Carbomers 35000 / 50000	13186201	2
Caelo	Carbomers 35000 / 50000	28111310	1
Caelo	Carbomers 35000 / 50000	31631293	1
Caelo	Carbomers 35000 / 50000	2913M1232	1

- 76 891 spectra from 463 *Apo-Ident* customers from a total of 25 463 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Carbomers 35000 / 50000* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Carbomers 35000 / 50000* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	360	0	72 073
Type B	0	420	0	161 653
Type C	0	258	10	76 891

The substance/substance group *Carbomers 35000 / 50000* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9887 %)	100.0000 % (> 98.3333 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 98.5714 %)
Type C	100.0000 % (> 99.8850 %)	96.2687 % (> 95.1493 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20978	20978	0.00	44.76
20979	20979	0.00	42.66
21354	22250	8.23	37.56
21561	22686	5.88	37.12
22250	22250	0.00	38.45
22548	22548	0.00	38.01
22686	22686	0.00	38.65
22759	22759	0.00	25.30
22852	22852	0.00	40.76

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Carmellose sodium (400 / 450 / 500 / 600 / 1600 …**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20866-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Carmellose sodium (400 / 450 / 500 / 600 / 1600 / 2000 mPa · s); Carmellosum natricum (400 / 450 / 500 / 600 / 1600 / 2000 mPa · s); Natrii carboxymethylcellulosi (400 / 450 / 500 / 600 / 1600 / 2000 mPa · s)

Special notes

When selecting the *Carmellose sodium (400 / 450 / 500 / 600 / 1600 / 2000* mPa · s*)* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Carmellose sodium (400 / 450 / 500 / 600 / 1600 / 2000* mPa · s*)*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Carmellose sodiu…	12354404	20866	40	1401185
Caelo	Carmellose sodiu…	13104807	20872	40	1401186
Fagron	Carmellose sodiu…	13D22-N02	20892	40	1401187

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Carmellose sodiu…	14029211	21382	40	20140127
Caelo	Carmellose sodiu…	13299310	21432	40	20131002
Caelo	Carmellose sodiu…	161714	22645	40	20160713*
Caelo	Carmellose sodiu…	16171406	23187	40	AR-17-FG-015964-01
Caelo	Carmellose sodiu…	180486	24039	40	20180228*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 320 spectra of 8 reference samples from the substance/substance group *Carmellose sodium (400 / 450 / 500 / 600 / 1600 / 2000* mPa · s*)*. These samples are listed above in the section *calibration samples*. The reference samples originate from 8 different batches.

- 72 113 spectra from a total of 1574 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 180 spectra from 5 reference samples of the substance/substance group *Carmellose sodium (400 / 450 / 500 / 600 / 1600 / 2000* mPa · s*)*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
zu erfassen	Carmellose sodium (400 / 450…	zu erfassen	20144	40
zu erfassen	Carmellose sodium (400 / 450…	zu erfassen	20147	40
Caelo	Carmellose sodium (400 / 450…	13299310	21432†	20
Caelo	Carmellose sodium (400 / 450…	17062304	23519	40
Caelo	Carmellose sodium (400 / 450…	172446	23623	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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- 161 893 spectra from a total of 3496 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 48 spectra from 24 *Apo-Ident* customers from 32 batches from the substance/substance group *Carmellose sodium (400 / 450 / 500 / 600 / 1600 / 2000* mPa · s*)*.

- These include spectra of independent samples from 29 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Carmellose sodium (400 / 450…	12354416	3
Caelo	Carmellose sodium (400 / 450…	11124211	1
Caelo	Carmellose sodium (400 / 450…	11124212	1
Bombastus	Carmellose sodium (400 / 450…	13104813	3
Caelo	Carmellose sodium (400 / 450…	13104810	3
Caelo	Carmellose sodium (400 / 450…	12354414	1
Phönix	Carmellose sodium (400 / 450…	12354416	1
Caelo	Carmellose sodium (400 / 450…	13104802	3
Caelo	Carmellose sodium (400 / 450…	1315Q-03302	1
Caelo	Carmellose sodium (400 / 450…	13104807	1
Caelo	Carmellose sodium (400 / 450…	13G19-N02	1
Caelo	Carmellose sodium (400 / 450…	13299302	2
Gehe 06.10.14	Carmellose sodium (400 / 450…	13299312	1
Caelo	Carmellose sodium (400 / 450…	15123908	3
Caelo	Carmellose sodium (400 / 450…	14149806	1
Caelo	Carmellose sodium (400 / 450…	15123901	3
Caelo	Carmellose sodium (400 / 450…	14029201	1
Caelo	Carmellose sodium (400 / 450…	28051402	1
Noweda	Carmellose sodium (400 / 450…	12354401	1
Fagron	Carmellose sodium (400 / 450…	15G03-Bo2-312862	1
Caelo	Carmellose sodium (400 / 450…	913M-03302	1
Caelo	Carmellose sodium (400 / 450…	11124218	1
Caelo	Carmellose sodium (400 / 450…	12079615	1
Caelo	Carmellose sodium (400 / 450…	12079618	1
Caelo	Carmellose sodium (400 / 450…	12354408	3
Caelo	Carmellose sodium (400 / 450…	12255708	1
Fagron	Carmellose sodium (400 / 450…	13D22-N02	1
Anzag/	Carmellose sodium (400 / 450…	21733	1
Caelo	Carmellose sodium (400 / 450…	12354403	1
Caelo	Carmellose sodium (400 / 450…	14029211	1
Gutenberg-Apotheke	Carmellose sodium (400 / 450…	4811E-03302	1
Sanacorp	Carmellose sodium (400 / 450…	AKD6	1
Caelo	Carmellose sodium (400 / 450…	12354418	1

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

- 77 111 spectra from 463 *Apo-Ident* customers from a total of 25 517 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Carmellose sodium (400 / 450 / 500 / 600 / 1600 / 2000* mPa · s*)* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Carmellose sodium (400 / 450 / 500 / 600 / 1600 / 2000* mPa · s*)* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	320	0	72 113
Type B	0	169	11	161 893
Type C	0	42	6	77 111

The substance/substance group *Carmellose sodium (400 / 450 / 500 / 600 / 1600 / 2000* mPa · s*)* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9887 %)	100.0000 % (> 98.1250 %)
Type B	100.0000 % (> 99.9928 %)	93.8889 % (> 92.2222 %)
Type C	100.0000 % (> 99.8850 %)	87.5000 % (> 81.2500 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20866	20866	0.00	52.48
20872	20872	0.00	57.23
20892	20892	0.00	56.01
21382	20872	8.50	54.41
21432	20866	15.09	50.07
22645	22645	0.00	48.84
23187	23187	0.00	48.48
24039	24039	0.00	48.85

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Cellulose, microcrystalline**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20708-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Cellulose, microcrystalline; Cellulosum microcristallinum; Cellulosum microcrystallisatum

Special notes

When selecting the *Cellulose, microcrystalline* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Cellulose, microcrystalline*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Cellulose, micro…	12C23-N06	20708	70	1403080
Euro OTC	Cellulose, micro…	1201004-01	20728	40	20120201
Euro OTC	Cellulose, micro…	1211037-01	21080	40	20121207
Euro OTC	Cellulose, micro…	1507022	21857	40	20150805*
Euro OTC	Cellulose, micro…	1604029	22559	40	20160512*
Fagron	Cellulose, micro…	16B24-B11-323324	22896	40	20160311

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 270 spectra of 6 reference samples from the substance/substance group *Cellulose, microcrystalline*. These samples are listed above in the section *calibration samples*. The reference samples originate from 6 different batches.

- 72 163 spectra from a total of 1576 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 220 spectra from 6 reference samples of the substance/substance group *Cellulose, microcrystalline*.

- These include spectra of independent samples from 4 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Cellulose, microcrystalline	1211037-01	21085	40
Euro OTC	Cellulose, microcrystalline	1507022	21857†	20
Euro OTC	Cellulose, microcrystalline	1607042	22794	40
Euro OTC	Cellulose, microcrystalline	1604029-01	22815	40
Euro OTC	Cellulose, microcrystalline	1610030	22876	40
Euro OTC	Cellulose, microcrystalline	1712009	23909	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 853 spectra from a total of 3493 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 33 spectra from 24 *Apo-Ident* customers from 19 batches from the substance/substance group *Cellulose, microcrystalline*.

- These include spectra of independent samples from 18 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Euro OTC	Cellulose, microcrystalline	1309001-01	3
Euro OTC	Cellulose, microcrystalline	1211037-01	3
Euro OTC	Cellulose, microcrystalline	1410002-01	4
Euro OTC	Cellulose, microcrystalline	1309001-02	2
Euro OTC	Cellulose, microcrystalline	135010001	1
Euro OTC	Cellulose, microcrystalline	150702201	1
Fagron	Cellulose, microcrystalline	2013M-01350	1
Euro OTC	Cellulose, microcrystalline	1604029-01	2
Euro OTC	Cellulose, microcrystalline	700204	1
Euro OTC	Cellulose, microcrystalline	1610030-01	1
Euro OTC	Cellulose, microcrystalline	1607042-01	1
Fagron	Cellulose, microcrystalline	16B24-B11	1
Fagron	Cellulose, microcrystalline	15C03-B06-305242	1
Fagron	Cellulose, microcrystalline	17A11-B04-331463	1
EuRho	Cellulose, microcrystalline	1201004-02	1
Fagron	Cellulose, microcrystalline	9K10-N10	1
Euro OTC	Cellulose, microcrystalline	1201004-02	2
Phnoix	Cellulose, microcrystalline	1211037-01	1
Euro OTC	Cellulose, microcrystalline	121103701	1
Koisser	Cellulose, microcrystalline	E0790	1
Fagron	Cellulose, microcrystalline	13A03-N01	1
Phoenix	Cellulose, microcrystalline	1309001-02	1
apo-ident.	Cellulose, microcrystalline	1604029-01	1

- 77 126 spectra from 463 *Apo-Ident* customers from a total of 25 528 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Cellulose, microcrystalline* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Cellulose, microcrystalline* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect.

The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	270	0	72 163
Type B	0	220	0	161 853
Type C	0	32	1	77 126

The substance/substance group *Cellulose, microcrystalline* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.7778 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 97.2727 %)
Type C	100.0000 % (> 99.8850 %)	96.9697 % (> 87.8788 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20708	20708	0.00	59.88
20728	20708	3.15	59.46
21080	20708	7.31	55.57
21857	21857	0.00	60.14
22559	22559	0.00	71.32
22896	21857	3.03	58.66

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Cetostearyl alcohol**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20738-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Cetostearyl alcohol; Alcohol cetylicus; Alcohol cetylicus et stearylicus; Alcohol cetylicus et stearylicus emulsificans A; Alcohol cetylstearylicus; Alcohol cetylstearylicus emulsificans A; Cetomacrogol emulsifying wax 1000 NI; Cetyl alcohol; Emulsifying cetostearyl alcohol (type A)

Special notes

When selecting the *Cetostearyl alcohol* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Cetostearyl alcohol*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Cetomacrogol emu…	12H07-N06	20738	30	20120905
Caelo	Cetyl alcohol	13096901	20896	40	1405179
Fagron	Cetostearyl alco…	13C13-N13	20968	40	1402265

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Cetomacrogol emu…	13C05-B40-289262	21054	40	1408003
Fagron	Emulsifying ceto…	13L17-B05	21279	40	1505070
Caelo	Cetostearyl alco…	14054504	21314	40	20140226
Caelo	Emulsifying ceto…	13233005	21319	30	1506057
Caelo	Cetomacrogol emu…	14055001	21381	40	20140225
Caelo	Cetyl alcohol	13286502	21435	40	20130925
Caelo	Emulsifying ceto…	14322505	21830	40	20141031
Euro OTC	Emulsifying ceto…	1510043	21998	40	20151124*
Euro OTC	Emulsifying ceto…	1504010-01	22264	40	20150423
Caelo	Cetyl alcohol	15323301	22266	40	AR-16-FG-008835-01
Caelo	Emulsifying ceto…	153857	22332	40	20151202*
Caelo	Emulsifying ceto…	153856	22334	40	20160210*
Caelo	Cetomacrogol emu…	15277504	22390	40	20150828
Caelo	Cetomacrogol emu…	160804	22397	40	20160323*
Caelo	Cetyl alcohol	161063	22398	40	20160420*
Caelo	Cetyl alcohol	161063	22403	40	20160420*
Euro OTC	Cetyl alcohol	1508014-01	22611	40	20150821
Fagron	Emulsifying ceto…	16I13-B01-326511	23022	40	20161024
Caelo	Cetostearyl alco…	17049205	23725	40	20170302

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 860 spectra of 22 reference samples from the substance/substance group *Cetostearyl alcohol*. These samples are listed above in the section *calibration samples*. The reference samples originate from 21 different batches.

- 71 573 spectra from a total of 1561 batches from further 362 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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- 1360 spectra from 36 reference samples of the substance/substance group *Cetostearyl alcohol*.

- These include spectra of independent samples from 17 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Cetostearyl alcohol	82753089	20113	60
Caelo	Emulsifying cetostearyl alco…	10040502	20163	40
Caelo	Cetyl alcohol	10144209	20283	30
Caelo	Emulsifying cetostearyl alco…	11L22-N09	20513	40
Fagron	Cetostearyl alcohol	12C21-N09	20555	40
Fagron	Emulsifying cetostearyl alco…	12C30-N01	20586	40
Fagron	Emulsifying cetostearyl alco…	11291113	20636	40
Fagron	Cetomacrogol emulsifying wax…	12H07-N06	20738†	10
Caelo	Cetyl alcohol	13286502	21318	40
Caelo	Emulsifying cetostearyl alco…	13233005	21434	60
Caelo	Cetyl alcohol	13286502	21435†	20
Caelo	Cetostearyl alcohol	14054504	21442	60
Caelo	Emulsifying cetostearyl alco…	14322505	21830†	20
Euro OTC	Emulsifying cetostearyl alco…	1510043	21998†	20
Euro OTC	Emulsifying cetostearyl alco…	1504010-01	22264†	20
Caelo	Cetyl alcohol	15323301	22266†	20
Caelo	Emulsifying cetostearyl alco…	153857	22331	60
Caelo	Emulsifying cetostearyl alco…	153857	22332†	20
Caelo	Emulsifying cetostearyl alco…	153856	22333	60
Caelo	Emulsifying cetostearyl alco…	153856	22334†	20
Caelo	Cetomacrogol emulsifying wax…	160804	22395	40
Caelo	Cetomacrogol emulsifying wax…	160804	22396	40
Caelo	Cetyl alcohol	161063	22399	40
Caelo	Cetyl alcohol	161063	22400	40
Caelo	Cetyl alcohol	161063	22401	40
Caelo	Cetyl alcohol	161063	22402	40
Euro OTC	Emulsifying cetostearyl alco…	1604013	22540	40
Euro OTC	Emulsifying cetostearyl alco…	1701031	22999	40
Caelo	Cetyl alcohol	170473	23068	40
Caelo	Cetostearyl alcohol	170492	23097	40
Euro OTC	Emulsifying cetostearyl alco…	1705001	23381	40
Caelo	Emulsifying cetostearyl alco…	171980	23575	40
Euro OTC	Emulsifying cetostearyl alco…	1711001	23737	40
Caelo	Cetostearyl alcohol	172979	23819	40
Caelo	Cetyl alcohol	173155	23973	40
Caelo	Emulsifying cetostearyl alco…	180180	24033	40

- 160 713 spectra from a total of 3470 batches from further 860 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

- 564 spectra from 208 *Apo-Ident* customers from 197 batches from the substance/substance group *Cetostearyl alcohol*.

- These include spectra of independent samples from 187 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Emulsifying cetostearyl alco…	13F07-N05	10
Caelo	Cetyl alcohol	13286502	6
Fagron	Emulsifying cetostearyl alco…	12L19-N03	8
Caelo	Emulsifying cetostearyl alco…	13233008	2
Fagron	Emulsifying cetostearyl alco…	13L17-B05	2
Caelo	Emulsifying cetostearyl alco…	13352102	1
Fagron	Emulsifying cetostearyl alco…	13L17-B05-289805	6
Caelo	Emulsifying cetostearyl alco…	14158201	10
Fagron	Cetostearyl alcohol	14G31-B03	1
Caelo	Emulsifying cetostearyl alco…	14322505	9
Caelo	Cetostearyl alcohol	14346201	4
Caelo	Emulsifying cetostearyl alco…	15090706	2
Sanacorp	Emulsifying cetostearyl alco…	15090701	1
Caelo	Emulsifying cetostearyl alco…	15271402	9
Caelo	Emulsifying cetostearyl alco…	15271405	9
Euro OTC	Emulsifying cetostearyl alco…	15271403	1
Fagron	Emulsifying cetostearyl alco…	15C31-B99-307062	3
Caelo	Cetyl alcohol	P134/14	1
Caelo	Cetyl alcohol	13210504	12
Fagron	Cetostearyl alcohol	3414E-01078	1
Fagron	Emulsifying cetostearyl alco…	12G02-N04	6
Fagron	Cetostearyl alcohol	12C30-N01	3
Fagron	Cetostearyl alcohol	7886542	1
Fagron	Emulsifying cetostearyl alco…	9652865	2
Sanacorp	Emulsifying cetostearyl alco…	12J29-N04	1
Caelo	Emulsifying cetostearyl alco…	12331402	7
Fagron	Emulsifying cetostearyl alco…	12J29-N04	4
A.H.D.	Emulsifying cetostearyl alco…	12L19-N03	2
Caelo	Emulsifying cetostearyl alco…	13233002	2
Caelo	Emulsifying cetostearyl alco…	13144105	12
Caelo	Cetyl alcohol	12271103	6
Caelo	Cetyl alcohol	13096901	6
Euro OTC	Cetyl alcohol	13286502	1
Caelo	Cetyl alcohol	14262204	7
Caelo	Cetyl alcohol	14141501	1
Caelo	Cetyl alcohol	14349101	12
Caelo	Cetyl alcohol	1523316	1
Caelo	Cetyl alcohol	15323301	5
Caelo	Cetyl alcohol	15323311	5
Caelo	Cetyl alcohol	16106307	2
Caelo	Cetyl alcohol	1112013B	1
Caelo	Cetyl alcohol	16335802	2
Caelo	Cetyl alcohol	16335807	1
Gatt-Koller	Cetyl alcohol	1690/06162416	1
Finze	Cetyl alcohol	10321703	1
Euro OTC	Cetyl alcohol	1105055-01	1
EuRho Anzag ek:3,47EUR	Cetyl alcohol	110505501	1
Caelo	Cetyl alcohol	12018605	2
Caelo	Cetyl alcohol	11153405	1
Caelo	Cetyl alcohol	11320702	3
Caelo	Cetyl alcohol	11153416	1
Euro OTC	Cetyl alcohol	1206020-01	1

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Supplier	Substance	Batch	Spectra
Euro OTC	Cetyl alcohol	1211002-01	3
EuRho	Cetyl alcohol	1206020-01	1
Caelo	Cetyl alcohol	12338604	7
Fagron	Cetyl alcohol	12A-02N12	1
Phönix	Cetyl alcohol	13096901	1
Phonix	Cetyl alcohol	13210504	1
Caelo	Cetyl alcohol	13096904	2
Sanacorpaelo /Sanacorp	Cetyl alcohol	1AKS11	1
Caelo	Cetyl alcohol	20250112-1	1
Caelo	Emulsifying cetostearyl alco…	12065709	7
Berkel AHK	Cetostearyl alcohol	13144105	1
Euro OTC	Cetostearyl alcohol	130503501	1
Caelo	Cetostearyl alcohol	13144105	2
Caelo	Cetostearyl alcohol	13018306	2
ahd/lamotte	Cetostearyl alcohol	13210504	1
Fagron	Cetostearyl alcohol	13F07-N05	2
Caelo	Cetostearyl alcohol	13206206	4
Caelo	Cetostearyl alcohol	13018305	7
Fagron	Cetostearyl alcohol	13L17-B05-289806	3
Fagron	Cetostearyl alcohol	13L17-B05	1
Fagron	Cetostearyl alcohol	13L17-B05-289805	2
Fagron	Cetostearyl alcohol	13L17-B05-294999	1
Euro OTC	Cetostearyl alcohol	1404019-01	2
Caelo	Cetostearyl alcohol	14054504	4
Euro OTC	Cetostearyl alcohol	1404019-02	1
Gehe	Cetostearyl alcohol	14054504	1
Caelo	Cetostearyl alcohol	14054508	3
Berkel AHK	Cetostearyl alcohol	14158201	2
Caelo	Cetostearyl alcohol	14158201	4
Caelo	Cetostearyl alcohol	14215007	7
Phoenix	Cetostearyl alcohol	14322505	2
Caelo	Cetostearyl alcohol	14322506	1
Fagron	Cetostearyl alcohol	14346201	1
Caelo	Cetostearyl alcohol	15271405	2
Caelo	Cetostearyl alcohol	15090701	2
Euro OTC	Cetostearyl alcohol	1504010-01	1
Caelo	Cetostearyl alcohol	15272702	2
Caelo	Cetostearyl alcohol	15271407	1
Fagron	Cetostearyl alcohol	14G31-B03-297611	1
Euro OTC	Cetostearyl alcohol	150401001	1
Caesar/Noweda	Cetostearyl alcohol	15272705	1
Caelo	Cetostearyl alcohol	15272717	2
Caelo	Cetostearyl alcohol	15272709	5
Fagron	Cetostearyl alcohol	15D24-B02-311993	1
Ebert-Jacobi	Cetostearyl alcohol	16230603	1
Caelo	Cetostearyl alcohol	16119604	1
Fagron	Cetostearyl alcohol	15D24-B02-308261	2
Caelo	Cetostearyl alcohol	16238607	1
Fagron	Cetostearyl alcohol	16B23-B07-318218	1
Euro OTC	Cetostearyl alcohol	1705001-01	1
Bombastus	Cetostearyl alcohol	300132	2
Caesar & Loretz GmbH	Cetostearyl alcohol	17056806	1
Bombastus	Cetostearyl alcohol	295148	1
Caelo	Cetostearyl alcohol	17198003	1
Fagron	Cetostearyl alcohol	8256792	3
Sanacorp	Cetostearyl alcohol	575778	1
Fagron	Cetostearyl alcohol	9652865	1
Caelo	Cetostearyl alcohol	11302101	2
Euro OTC	Cetostearyl alcohol	1107035-01	1
Fagron	Cetostearyl alcohol	11E17-N13	1

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Supplier	Substance	Batch	Spectra
Fagron	Cetostearyl alcohol	11f30-n11	1
Caelo	Cetostearyl alcohol	11K17-N02	1
Caesar & Loretz GmbH, 4…	Cetostearyl alcohol	11302101	1
Fagron	Cetostearyl alcohol	10F17-N02	1
Fagron	Cetostearyl alcohol	11K17-N02	1
Caelo	Cetostearyl alcohol	12025301	2
Fagron	Cetostearyl alcohol	12/17-N05	1
Caelo	Cetostearyl alcohol	12021304	1
Euro OTC	Cetostearyl alcohol	1212019-01	1
Caelo	Cetostearyl alcohol	12065709	1
Euro OTC	Cetostearyl alcohol	1204015-01	1
Caelo	Cetostearyl alcohol	12065705	1
Fagron	Cetostearyl alcohol	12E30-N13	1
Fagron	Cetostearyl alcohol	12g02-n04	1
Fagron	Cetostearyl alcohol	12G02-N04	9
Fagron	Cetostearyl alcohol	12J17-N05	3
Fagron	Cetostearyl alcohol	12J17-NO5	1
Fagron	Cetostearyl alcohol	12J29-N04	1
Fagron	Cetostearyl alcohol	12K22-N03	3
Fagron	Cetostearyl alcohol	12L19-N03	1
Euro OTC	Cetostearyl alcohol	1305035-01	1
Caelo	Cetostearyl alcohol	1314405	1
Fagron	Cetostearyl alcohol	13C13-N13	1
Caesar/Noweda	Cetostearyl alcohol	2911E-01077	2
Euro OTC	Cetostearyl alcohol	20270912-2	1
Caelo	Cetostearyl alcohol	14061317	1
Caelo	Cetomacrogol emulsifying wax…	15113703	1
Caelo	Cetomacrogol emulsifying wax…	15277501	1
Caelo	Cetomacrogol emulsifying wax…	14055002	1
AHD	Cetomacrogol emulsifying wax…	8073743	1
Caelo	Cetomacrogol emulsifying wax…		1
Caelo	Cetomacrogol emulsifying wax…	12032002	1
Caelo	Cetomacrogol emulsifying wax…	13092401	1
Caelo	Emulsifying cetostearyl alco…	15789271	1
Euro OTC	Emulsifying cetostearyl alco…	10836573	1
Caelo	Emulsifying cetostearyl alco…	5011505	1
Caelo	Emulsifying cetostearyl alco…	9170717	1
Euro OTC	Emulsifying cetostearyl alco…	1212019-01	1
Caelo	Emulsifying cetostearyl alco…	13233005	12
Caelo	Emulsifying cetostearyl alco…	13233006	1
Caesar & Loretz GmbH	Emulsifying cetostearyl alco…	13233008	1
Sanacorp	Emulsifying cetostearyl alco…	13F07-N05	1
PHOENIX am07.04.2014	Emulsifying cetostearyl alco…	13F07-N05	1
Fagron	Emulsifying cetostearyl alco…	13I06-N04	1
Fagron	Emulsifying cetostearyl alco…	13L17B05289805	1
Alliance Health 24.07.2…	Emulsifying cetostearyl alco…	13L17-B05-289805	1
Fagron	Emulsifying cetostearyl alco…	13L17-B05-289806	3
Fagron	Emulsifying cetostearyl alco…	13L17-B05-294999	3
Caelo	Emulsifying cetostearyl alco…	13L17-B05-289806	1
Euro OTC	Emulsifying cetostearyl alco…	1404019-01	1
Caelo	Emulsifying cetostearyl alco…	14156201	1
Caelo	Emulsifying cetostearyl alco…	14322506	1
Fagron	Emulsifying cetostearyl alco…	14G31-B03-297610	3
Fagron	Emulsifying cetostearyl alco…	14G31-B03	1
Euro OTC	Emulsifying cetostearyl alco…	14G31-B03-297610	1
alliance health. 05.05.…	Emulsifying cetostearyl alco…	14G31-B03-297610	1
Fagron	Emulsifying cetostearyl alco…	14G31-B03-305612	2
Euro OTC	Emulsifying cetostearyl alco…	1504010-01	1
Euro OTC	Emulsifying cetostearyl alco…	150410-01	1
Caelo	Emulsifying cetostearyl alco…	15090701	9

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Supplier	Substance	Batch	Spectra
Caelo	Emulsifying cetostearyl alco…	15090703	3
Euro OTC	Emulsifying cetostearyl alco…	1510043-01	1
Caesar&Loretz/Noweda	Emulsifying cetostearyl alco…	15271405	1
Caelo	Emulsifying cetostearyl alco…	15271407	3
Sanacorp	Emulsifying cetostearyl alco…	15271405	1
Caelo	Emulsifying cetostearyl alco…	15271408	2
Caelo	Emulsifying cetostearyl alco…	15385602	3
Caelo	Emulsifying cetostearyl alco…	15385606	1
Fagron	Emulsifying cetostearyl alco…	15C31-B00-307062	1
Fagron	Emulsifying cetostearyl alco…	15D24-B02	1
Fagron	Emulsifying cetostearyl alco…	15D24-B02-308261	3
Fagron	Emulsifying cetostearyl alco…	15D24-B02-311993	7
Euro OTC	Emulsifying cetostearyl alco…	1604013-02	2
Caesar & Loretz GmbH	Emulsifying cetostearyl alco…	16119604	3
Caelo	Emulsifying cetostearyl alco…	16119604	6
Caelo	Emulsifying cetostearyl alco…	16238607	1
Fagron	Emulsifying cetostearyl alco…	16B23-B07-318218	1
Fagron	Emulsifying cetostearyl alco…	16B23-B07-320384	4
Fagron	Emulsifying cetostearyl alco…	16B23-B07-323025	1
Gehe	Emulsifying cetostearyl alco…	1701031-01	1
Caelo	Emulsifying cetostearyl alco…	17056802	1
Caelo	Emulsifying cetostearyl alco…	17056806	2
Caesar & Loretz GmbH	Emulsifying cetostearyl alco…	17132001	1
Caelo	Emulsifying cetostearyl alco…	17198003	1
Fagron	Emulsifying cetostearyl alco…	17D28-B06-334609	1
Caelo	Emulsifying cetostearyl alco…	23051503	1
Bombastus	Emulsifying cetostearyl alco…	288691	3
Caelo	Emulsifying cetostearyl alco…		1
Bombastus	Emulsifying cetostearyl alco…	300132	2
Bombastus	Emulsifying cetostearyl alco…	295148	1
Henry Lamotte / Noweda	Emulsifying cetostearyl alco…	300132	1
Bombastus	Emulsifying cetostearyl alco…	303935	1
Caelo	Emulsifying cetostearyl alco…	303935	1
Caelo	Emulsifying cetostearyl alco…	31032015B	1
Caelo	Emulsifying cetostearyl alco…	608/10072017	1
Fagron	Emulsifying cetostearyl alco…	8256792	2
GEHE	Emulsifying cetostearyl alco…	8440094	1
Fagron	Emulsifying cetostearyl alco…	14175700	1
Euro OTC	Emulsifying cetostearyl alco…	1003050-01	1
Caelo	Emulsifying cetostearyl alco…	11291103	2
Fagron	Emulsifying cetostearyl alco…	11L22-N09	1
Caesar &Loretz GmbH	Emulsifying cetostearyl alco…	12065703	1
Fagron	Emulsifying cetostearyl alco…	12602-N04	1
Caelo	Emulsifying cetostearyl alco…	12331407	3
Caelo	Emulsifying cetostearyl alco…	12C30-N01	1
Fagron	Emulsifying cetostearyl alco…	12G02N04	1
Anzag	Emulsifying cetostearyl alco…	12G02-N04	1
Caelo	Emulsifying cetostearyl alco…	13144104	4
Noweda	Emulsifying cetostearyl alco…	13144104	1
Phönix	Emulsifying cetostearyl alco…	1323305	1
Sanacorp	Emulsifying cetostearyl alco…	13I06-N04	1
Caesar&loretz,Phoenix	Emulsifying cetostearyl alco…	14158201	1
Caelo	Emulsifying cetostearyl alco…	14G31-B03-305612	3
Caelo	Emulsifying cetostearyl alco…	15271403	4
Euro OTC	Emulsifying cetostearyl alco…	15271410	1
Fagron	Emulsifying cetostearyl alco…	20260712-2	1
Caelo	Emulsifying cetostearyl alco…	25/AKD1	1
Bombastus	Emulsifying cetostearyl alco…	278418	1
Noweda	Emulsifying cetostearyl alco…	13065576	1
Euro OTC	Emulsifying cetostearyl alco…	1404019-02	1

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Supplier	Substance	Batch	Spectra
Caelo	Emulsifying cetostearyl alco…	13144103	1
Euroh/Noweda	Emulsifying cetostearyl alco…	1504010-01	1
Caelo	Emulsifying cetostearyl alco…	14322512	1
Phönix	Emulsifying cetostearyl alco…	15C31-B99-307062	1
Caelo	Emulsifying cetostearyl alco…	15271410	1
Fagron	Emulsifying cetostearyl alco…	2215I-01078	1
Caelo	Cetyl alcohol	1212E-01076	1
Caelo	Emulsifying cetostearyl alco…	19032014B	1
Bombastus	Emulsifying cetostearyl alco…	265360	1
Caelo	Emulsifying cetostearyl alco…	23091402	1
Caelo	Emulsifying cetostearyl alco…	Unbekannt	1
Fagron	Emulsifying cetostearyl alco…	3013M-01078	1
Fagron	Emulsifying cetostearyl alco…	11499002	1
Caelo	Emulsifying cetostearyl alco…	2011404	1
Caelo	Emulsifying cetostearyl alco…	11009204	1
Caelo	Emulsifying cetostearyl alco…	11291101	1
Caesar/Noweda	Emulsifying cetostearyl alco…	11343405	1
Caelo	Emulsifying cetostearyl alco…	11291104	1
Noweda	Emulsifying cetostearyl alco…	12065705	1
Caelo	Emulsifying cetostearyl alco…	12065703	1
Caesar/Noweda	Emulsifying cetostearyl alco…	12065707	1
Caelo	Emulsifying cetostearyl alco…	12229402	2
Caelo	Emulsifying cetostearyl alco…	12134203	1
Caelo	Emulsifying cetostearyl alco…	12231402	1
Euro OTC	Emulsifying cetostearyl alco…	1305035-01	2
Caelo	Emulsifying cetostearyl alco…	13144107	3
Caesar/Lorenz	Emulsifying cetostearyl alco…	13233005	1
Phoenix 26.11.12	Emulsifying cetostearyl alco…	13144105	1
Caelo	Emulsifying cetostearyl alco…	13233001	1
Caelo	Emulsifying cetostearyl alco…	17132001	1
Caelo	Emulsifying cetostearyl alco…	18081201	1
Caelo	Emulsifying cetostearyl alco…	21121-01078	1
Caelo	Emulsifying cetostearyl alco…	3951/V04/16	1
Caelo	Emulsifying cetostearyl alco…	24101305	1
Caelo	Emulsifying cetostearyl alco…	25051201	1
Sanacorp	Cetostearyl alcohol	13206206	1
Fagro	Emulsifying cetostearyl alco…	5211Q-01078	1
Caelo	Cetostearyl alcohol	11162305	1

- 76 595 spectra from 463 *Apo-Ident* customers from a total of 25 353 batches from a further 697 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Cetostearyl alcohol* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Cetostearyl alcohol* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

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	False positive	True positive	False negative	True negative
Type A	0	860	0	71 573
Type B	0	1335	25	160 713
Type C	0	539	25	76 595

The substance/substance group *Cetostearyl alcohol* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9887 %)	100.0000 % (> 99.3023 %)
Type B	100.0000 % (> 99.9928 %)	98.1618 % (> 97.9412 %)
Type C	100.0000 % (> 99.8849 %)	95.5674 % (> 95.0355 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20738	21054	4.17	48.77
20896	20896	0.00	45.94
20968	20968	0.00	47.46
21054	21054	0.00	43.41
21279	21279	0.00	51.08
21314	21998	9.92	47.04
21319	21319	0.00	53.43
21381	22397	6.19	50.52
21435	20896	21.82	45.14
21830	21998	1.66	52.47
21998	21998	0.00	52.02
22264	22334	1.31	50.28
22266	22266	0.00	44.15
22332	22332	0.00	49.37
22334	22334	0.00	50.39
22390	21054	5.88	52.39
22397	22397	0.00	36.71
22398	22398	0.00	44.85
22403	22403	0.00	45.99
22611	22398	23.62	44.09
23022	22334	2.43	51.00
23725	20968	9.91	46.75

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Chloral hydrate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20322-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Chloral hydrate; Chlorali hydras; Chloralum hydratum

Special notes

When selecting the *Chloral hydrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Chloral hydrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Chloral hydrate	13F06-N07	21231	40	20130626
Caelo	Chloral hydrate	13213311	21309	40	20130712
Caelo	Chloral hydrate	15448318	22963	40	1704462
Caelo	Chloral hydrate	16355802	23094	40	20170112

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 4 reference samples from the substance/substance group *Chloral hydrate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 4 different batches.

- 72 273 spectra from a total of 1578 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 280 spectra from 7 reference samples of the substance/substance group *Chloral hydrate*.

- These include spectra of independent samples from 6 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Chloral hydrate	11J05-N01	20322	40
Fagron	Chloral hydrate	12C26-M04	20552	40
Caelo	Chloral hydrate	154483	23355	40
Fagron	Chloral hydrate	17E05-B05-335580	23572	40
Caelo	Chloral hydrate	172506	23646	40
Caelo	Chloral hydrate	172477	23678	40
Caelo	Chloral hydrate	172477	23815	40

- 161 793 spectra from a total of 3493 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

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Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 197 spectra from 93 *Apo-Ident* customers from 82 batches from the substance/substance group *Chloral hydrate*.

- These include spectra of independent samples from 78 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Chloral hydrate	12H06-N080160/161	1
Caelo	Chloral hydrate	3121403	1
Fagron	Chloral hydrate	12H06-N081114/1612	1
Fagron	Chloral hydrate	12H06-N08	17
Fagron	Chloral hydrate	12H06N8	1
Caelo	Chloral hydrate	13002425	4
Caelo	Chloral hydrate	13002417	4
Caelo	Chloral hydrate	13213311	1
Fagron	Chloral hydrate	13D22-N11	1
Fagron	Chloral hydrate	13F06-N07	4
Caelo	Chloral hydrate	1403815	1
Fagron	Chloral hydrate	13K05-B13	1
Caelo	Chloral hydrate	14038301	4
Caelo	Chloral hydrate	14038306	1
Caelo	Chloral hydrate	14038311	4
Phönix Gotha	Chloral hydrate	14038302	1
Euro OTC	Chloral hydrate	14218702	1
Caelo	Chloral hydrate	14218705	3
Caelo	Chloral hydrate	14218704	3
Caelo	Chloral hydrate	14218701	2
Caelo	Chloral hydrate	14218709	6
Sanacorp	Chloral hydrate	14218705	1
Fagron	Chloral hydrate	14218710	1
CAESAR-LORETZ /GEHE	Chloral hydrate	14218710	1
Caelo	Chloral hydrate	14218710	1
Caelo	Chloral hydrate	14218712	1
Fagron	Chloral hydrate	14218712	1
Caelo	Chloral hydrate	14218714	4
Caelo	Chloral hydrate	14218713	1
Caelo	Chloral hydrate	14218719	6
Caelo	Chloral hydrate	14218716	1
Fagron	Chloral hydrate	14218719	1
Caelo	Chloral hydrate	14218720	1
Noweda29.04.2015	Chloral hydrate	15083701	2
Caelo	Chloral hydrate	15083703	10
Caelo	Chloral hydrate	15083701	1
Caelo	Chloral hydrate	15083704	1
Caelo	Chloral hydrate	15083705	1
Caelo	Chloral hydrate	15166501	2
Caelo	Chloral hydrate	15163901	1
Caelo	Chloral hydrate	15166502	4
Caelo	Chloral hydrate	15166503	4
Caelo	Chloral hydrate	15166505	4
Fagron	Chloral hydrate	15166505	1
Caelo	Chloral hydrate	15166506	4
Caelo	Chloral hydrate	15166507	3
Caelo	Chloral hydrate	15166508	2
Caelo	Chloral hydrate	15166513	3

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Supplier	Substance	Batch	Spectra
Caelo	Chloral hydrate	15448303	6
Caelo	Chloral hydrate	15448306	5
Caelo	Chloral hydrate	15448307	1
Caelo	Chloral hydrate	15448310	1
Ebert KKH 10.10.16	Chloral hydrate	15448308	1
Caelo	Chloral hydrate	15448312	5
Caelo	Chloral hydrate	15448313	4
hochhaus-Apotheke	Chloral hydrate	15448314	2
Caelo	Chloral hydrate	15448314	1
Caelo	Chloral hydrate	15448315	1
Caelo	Chloral hydrate	15448318	3
Caelo	Chloral hydrate	15448321	2
Caelo	Chloral hydrate	15448322	2
Fagron	Chloral hydrate	160609/1	1
FARGON	Chloral hydrate	10i14-n10	1
Fagron	Chloral hydrate	11D13-N07	1
Caelo	Chloral hydrate	17121402	1
Caelo	Chloral hydrate	414061	1
Caelo	Chloral hydrate	16355803	1
Gehe	Chloral hydrate	15448326	1
Caelo	Chloral hydrate	16248703	1
Fagron	Chloral hydrate	11J05-N01	1
Caelo	Chloral hydrate	12017503	1
Caelo	Chloral hydrate	12017512	2
Caelo	Chloral hydrate	12017518	1
Fagron	Chloral hydrate	12C26-M04	2
Fagron	Chloral hydrate	12C26-M05	1
Phönix,02.11.2012	Chloral hydrate	12C26-M05	1
Fagron	Chloral hydrate	12C26-M08	1
Phönix,02.11.2012	Chloral hydrate	12C26-M06	1
Fagron	Chloral hydrate	12H06N08	3
Fagron	Chloral hydrate	12H06-N080101/1612	1
Anzag 17.01.2013	Chloral hydrate	12H06-N08	1
Sanacorp	Chloral hydrate	12H06-N08	1
Gehe	Chloral hydrate	12H06-N08	1
Fagron	Chloral hydrate	12H06-N080013/494	1
Phönix Gotha	Chloral hydrate	13F06-N07	2
Fagron	Chloral hydrate	13F06-N070631/786	1
Caelo	Chloral hydrate	13d22-n11	1
Fargon/ Noweda	Chloral hydrate	13F06N07	1
Caelo	Chloral hydrate	14101307	1
Caelo	Chloral hydrate	25021401	1
FARGON	Chloral hydrate		1
GEHE	Chloral hydrate	21022172/4	1
Anzag	Chloral hydrate	12C26M04	1
Caelo	Chloral hydrate	13002405	1

- 76 962 spectra from 463 *Apo-Ident* customers from a total of 25 466 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Chloral hydrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all

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relevant spectra of the various substances were compared with *Chloral hydrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	72 273
Type B	0	280	0	161 793
Type C	0	196	1	76 962

The substance/substance group *Chloral hydrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 97.8571 %)
Type C	100.0000 % (> 99.8850 %)	99.4924 % (> 97.9695 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21231	22963	6.65	53.63
21309	22963	3.51	53.65
22963	22963	0.00	53.78
23094	22963	5.52	53.45

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Chloramphenicol**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20097-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Chloramphenicol; Chloramphenicolum

Special notes

When selecting the *Chloramphenicol* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Chloramphenicol*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Chloramphenicol	11F20-N05	20777	90	1412249
Caelo	Chloramphenicol	11370716	20787	40	20120202
Caelo	Chloramphenicol	12248507	20807	40	20120831
Euro OTC	Chloramphenicol	1209019-02	20813	60	20130408
Fagron	Chloramphenicol	13A11-N02	20822	30	20130125

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Chloramphenicol	13080924	21701	40	1509287
Euro OTC	Chloramphenicol	1407043-01	21752	40	20140903
Fagron	Chloramphenicol	14E01-B02-308559	21910	40	20140513
Caelo	Chloramphenicol	14346908	21988	40	20150115
Euro OTC	Chloramphenicol	1602002	22367	30	20160309*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 450 spectra of 10 reference samples from the substance/substance group *Chloramphenicol*. These samples are listed above in the section *calibration samples*. The reference samples originate from 10 different batches.

- 71 983 spectra from a total of 1572 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 355 spectra from 11 reference samples of the substance/substance group *Chloramphenicol*.

- These include spectra of independent samples from 5 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Chloramphenicol	1209019-02	20815	60
Caelo	Chloramphenicol	13080924	21701†	20
Euro OTC	Chloramphenicol	1407043-01	21752†	20
Fagron	Chloramphenicol	14E01-B02-308559	21910†	20

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*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Chloramphenicol	14346908	21988†	20
Euro OTC	Chloramphenicol	1602002	22367†	15
Caelo	Chloramphenicol	15358906	22961	40
Fagron	Chloramphenicol	16I12-B07-327124	22962	40
Caelo	Chloramphenicol	162786	23353	40
Euro OTC	Chloramphenicol	1704021	23392	40
Caelo	Chloramphenicol	180178	24049	40

- 161 718 spectra from a total of 3488 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 889 spectra from 289 *Apo-Ident* customers from 182 batches from the substance/substance group *Chloramphenicol*.

- These include spectra of independent samples from 170 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Chloramphenicol	93323801	1
Caelo	Chloramphenicol	3081602	1
Caelo	Chloramphenicol	11370706	4
Caelo	Chloramphenicol	11370712	4
Caelo	Chloramphenicol	11370711	13
Euro OTC	Chloramphenicol	1203012-02	14
Euro OTC	Chloramphenicol	1209019-02	12
Euro OTC	Chloramphenicol	1209010-02	4
Euro OTC	Chloramphenicol	120250	1
Caelo	Chloramphenicol	1203012-02	1
Caelo	Chloramphenicol	12248520	8
Caelo	Chloramphenicol	12248524	10
Caelo	Chloramphenicol	12248525	6
Fagron	Chloramphenicol	12B13-N06	8
Euro OTC	Chloramphenicol	130801702	2
Euro OTC	Chloramphenicol	1302024-02	8
Euro OTC	Chloramphenicol	1302024-01	13
Caesar&Loretz GmbH/Anzag	Chloramphenicol	1308017-01	1
VDL	Chloramphenicol	1308017-01	1
EuRho/Phönix	Chloramphenicol	1308017-01	1
Euro OTC	Chloramphenicol	130801701	1
Euro OTC	Chloramphenicol	1308017-01	8
Caelo	Chloramphenicol	1308017-01	1
euroct/gehe	Chloramphenicol	1308017-01	2

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†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Supplier	Substance	Batch	Spectra
PHOENIX 25.04.2014	Chloramphenicol	1308017-02	2
Bombastus	Chloramphenicol	1308017-01	1
Euro OTC	Chloramphenicol	1308017-02	11
Anzag	Chloramphenicol	1308017-02	1
Euro/ Sanacorp	Chloramphenicol	1308017-02	1
Caelo	Chloramphenicol	13080903	13
Gehe	Chloramphenicol	1308017-02	1
ANZAG	Chloramphenicol	1308017-02	1
Caelo	Chloramphenicol	13080303	1
Caelo	Chloramphenicol	13080904	5
Caelo	Chloramphenicol	13080907	14
Phönix Gotha	Chloramphenicol	13080907	1
AHD	Chloramphenicol	13080904	1
Nanjing Baijingyu Pharm...	Chloramphenicol	13080908	2
noweda	Chloramphenicol	13080908	1
Caelo	Chloramphenicol	13080908	3
Caelo	Chloramphenicol	13080917	4
Caelo	Chloramphenicol	13080915	1
Caelo	Chloramphenicol	13080918	3
Caelo	Chloramphenicol	13080923	15
Phönix	Chloramphenicol	13080921	1
Caelo	Chloramphenicol	13080921	2
Caelo	Chloramphenicol	13080924	18
Caelo	Chloramphenicol	13080925	18
Euro OTC	Chloramphenicol	13111410	1
Fagron	Chloramphenicol	13A11-N02	8
Fagron	Chloramphenicol	13A31-B02	8
Phönix	Chloramphenicol	13A1-802	1
Caelo	Chloramphenicol	13A31-B02-286708	3
Fagron	Chloramphenicol	13A31-B02286708	1
Caelo	Chloramphenicol	13A31-B02-286709	1
Fagron	Chloramphenicol	13A31-B02-286709	3
Gutenberg-Apotheke	Chloramphenicol	13A31-B02-286710	1
Euro OTC	Chloramphenicol	1407043-01	24
Caelo	Chloramphenicol	140704301	2
Euro OTC	Chloramphenicol	1407043	1
Fagron	Chloramphenicol	13A31-B02-290300	1
Fagron	Chloramphenicol	13A31-B02-290263	1
Euro OTC	Chloramphenicol	140704301	3
Sanacorp	Chloramphenicol	140704301	1
Northeast General	Chloramphenicol	1407043-01	1
Alliance 15.04.2015 Ek ...	Chloramphenicol	1407043-01	1
Caelo	Chloramphenicol	1407043-01	1
VDL	Chloramphenicol	140743-01	1
Caelo	Chloramphenicol	14246917	1
Caelo	Chloramphenicol	1434608	1
Caelo	Chloramphenicol	14346901	3
Caelo	Chloramphenicol	14346904	3
Noweda	Chloramphenicol	14346901	2
Caelo	Chloramphenicol	14346903	1
Caelo	Chloramphenicol	14346906	4
Caelo	Chloramphenicol	14346907	10
Caelo	Chloramphenicol	14346908	7
Noweda	Chloramphenicol	14346910	1
Caelo	Chloramphenicol	14346910	9
Caelo	Chloramphenicol	14346911	14
Caelo	Chloramphenicol	14346912	4
AHD	Chloramphenicol	14346912	1
Caelo	Chloramphenicol	14346913	9
Caelo	Chloramphenicol	14346914	2

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Supplier	Substance	Batch	Spectra
Caelo	Chloramphenicol	14346917	7
Caelo	Chloramphenicol	14346918	12
Caelo	Chloramphenicol	14346922	1
Caelo	Chloramphenicol	14346924	4
Fagron	Chloramphenicol	14E01-B02	4
Fagron	Chloramphenicol	14E01-B02-296623	1
Caelo	Chloramphenicol	14E01-B02-296623	1
Fagron	Chloramphenicol	14e01-b02-296624	1
Fagron	Chloramphenicol	14E01-B02-296624	6
Fagron	Chloramphenicol	14E01B02296624	1
Caelo	Chloramphenicol	14E01B02296624	1
Fagron	Chloramphenicol	14E01-B02-296625	1
Fagron	Chloramphenicol	14E01-B02-306146	7
Fagron	Chloramphenicol	14E01-B02-308559	7
Gehe 27.06.15/euro	Chloramphenicol	1502036-01	2
Caelo	Chloramphenicol		1
Euro OTC	Chloramphenicol	150203601	5
Euro OTC	Chloramphenicol	1502036-01	25
Euro OTC	Chloramphenicol	1502036	1
Euro OTG	Chloramphenicol	1502036-01	1
EuRho / 20	Chloramphenicol	1502036-01	1
Euro/Alliance Healthcare	Chloramphenicol	1502036-01	1
Fagron	Chloramphenicol	1502036-01	1
Caelo	Chloramphenicol	1502036-01	2
Sanacorp	Chloramphenicol	1502036-01	1
Euro OTC	Chloramphenicol	1502036-02	14
Caelo	Chloramphenicol	1502036-02	5
Euro OTC	Chloramphenicol	150203602	1
Northeast General/Noweda	Chloramphenicol	1502036-02	1
Euro OTC	Chloramphenicol	1502036-03	20
Euro OTC	Chloramphenicol	150203603	1
Caelo	Chloramphenicol	1502036-03	1
Caelo	Chloramphenicol	150203603	1
Fischer/ Noweda	Chloramphenicol	1502036-03	1
Caelo	Chloramphenicol	15358905	8
Phoe	Chloramphenicol	15358905	1
Caelo	Chloramphenicol	15358903	2
Caelo	Chloramphenicol	15358906	8
anzag	Chloramphenicol	15358907	1
Caelo	Chloramphenicol	15358907	1
Caelo	Chloramphenicol	15358908	2
Caelo	Chloramphenicol	15358909	4
Gehe	Chloramphenicol	15358909	1
Caelo	Chloramphenicol	15358912	4
phönix	Chloramphenicol	15358912	1
Caelo	Chloramphenicol	15358913	7
Caelo	Chloramphenicol	15358914	2
Fagron	Chloramphenicol	15G14-B04-322516	1
Fagron	Chloramphenicol	16/12-B07-332100	1
Fagron	Chloramphenicol		2
Fagron	Chloramphenicol	16/12-B07-326036	1
Euro OTC	Chloramphenicol	16020002-03	1
Euro OTC	Chloramphenicol	1602002-01	24
Caelo	Chloramphenicol	1602002-01	2
Euro OTC	Chloramphenicol	1602002-02	9
Northeast General / Gehe	Chloramphenicol	1602002-02	1
Fagron	Chloramphenicol	1602002-02	1
Euro OTC	Chloramphenicol	1602002-03	16
Caelo	Chloramphenicol	1602002-03	1
Fagron	Chloramphenicol	1602002-03	1

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Supplier	Substance	Batch	Spectra
Caelo	Chloramphenicol	16278602	1
Caelo	Chloramphenicol	16278608	1
Fagron	Chloramphenicol	16l12-B07-326036	1
Phönix	Chloramphenicol	16i12-b07-327124	1
Caelo	Chloramphenicol	16358909	1
Caelo	Chloramphenicol	1704021-01	1
Euro OTC	Chloramphenicol	1704021-01	1
Euro OTC	Chloramphenicol	170402101	1
Gehe - Hedinger	Chloramphenicol	1704021-01	1
Caelo	Chloramphenicol	43/AKD15	1
Fagron	Chloramphenicol	2111I-01259	1
Caelo	Chloramphenicol	4412Q-01259	1
Sanacorp	Chloramphenicol	41/AKD24	1
Euro OTC	Chloramphenicol	1704021-02	1
Euro OTC	Chloramphenicol	DY00912128	3
Euro OTC	Chloramphenicol	DY130525	1
Fagron	Chloramphenicol	DY00911233	4
AHDE 20.08.15	Chloramphenicol	DY00912128	1
Fagron	Chloramphenicol	DY00912129	1
Caelo	Chloramphenicol	DY130525	2
Euro OTC	Chloramphenicol	T02-55/1407043-01	1
Caelo	Chloramphenicol	310311	1
Euro OTC	Chloramphenicol	314Q1259	1
Euro OTC	Chloramphenicol	1012013-01	2
Caelo	Chloramphenicol	9323807	1
Phönix	Chloramphenicol	10341710	1
Caelo	Chloramphenicol	10341703	1
Caelo	Chloramphenicol	10341707	1
Caelo	Chloramphenicol	10341711	2
Caelo	Chloramphenicol	1103140 2	1
Phönix	Chloramphenicol	10341716	1
Euro OTC	Chloramphenicol	1107002-01	2
Caelo	Chloramphenicol	10341717	1
Caelo	Chloramphenicol	1107002-01	1
Gehe	Chloramphenicol	1107002-02	2
ANZAG am 23.05.2012	Chloramphenicol	1107002-02	2
Euro OTC	Chloramphenicol	110700202	1
Euro OTC	Chloramphenicol	1107002-02	1
Caelo	Chloramphenicol	1137004	1
Caelo	Chloramphenicol	1137070	1
Noweda	Chloramphenicol	1137014	1
Caelo	Chloramphenicol	11370702	5
Caelo	Chloramphenicol	11370703	6
Caelo	Chloramphenicol	11370705	4
Anzag 15.11.2012	Chloramphenicol	11370705	1
Caelo	Chloramphenicol	11370707	2
Phönix Gotha	Chloramphenicol	11370711	1
Bombastus	Chloramphenicol	11370711	1
Anzag ek:2.98EUR 25.08.12	Chloramphenicol	11370711	1
Sanacorp	Chloramphenicol	11370711	1
Anzag, 24.10.2012	Chloramphenicol	11370711	2
Caesar & Loretz GmbH	Chloramphenicol	11370711	1
Klenk	Chloramphenicol	11370711	1
Noweda	Chloramphenicol	11370712	1
Caelo	Chloramphenicol	11370713	3
Caelo	Chloramphenicol	11370714	2
Caelo	Chloramphenicol	11370716	5
Caelo	Chloramphenicol	11370715	1
Caelo	Chloramphenicol	11370717	2
Fagron	Chloramphenicol	11J14-N03	1

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Supplier	Substance	Batch	Spectra
Euro OTC	Chloramphenicol	1203012-01	9
Caelo	Chloramphenicol	1137714	1
Fagron	Chloramphenicol	1202500003	1
Kehr	Chloramphenicol	1203012-01	1
Gehe	Chloramphenicol	1203012-01	1
Euro OCT	Chloramphenicol	1203012-02	2
Kehr	Chloramphenicol	1203012-02	1
Euro OTC	Chloramphenicol	1209019-01	11
Euro OTC	Chloramphenicol	1203012-12	1
Caelo	Chloramphenicol	12072606	1
Anzag 12.03.2013	Chloramphenicol	1209019-01	2
Gehe	Chloramphenicol	1209019-01	1
Gehe	Chloramphenicol	1209019-02	1
Euro OTC	Chloramphenicol	120901902	3
Alliance Health	Chloramphenicol	1209019-02	1
Caelo	Chloramphenicol	12248501	15
Sanacorp	Chloramphenicol	120901902	1
Caelo	Chloramphenicol	12101302	1
Phönix Gotha	Chloramphenicol	12248501	1
Phönix 11.03.13	Chloramphenicol	12248501	1
vdl	Chloramphenicol	12248501	1
Anzag 03.04.13 ek: 3,18EUR	Chloramphenicol	12248501	1
GEHE	Chloramphenicol	12248501	1
Caelo	Chloramphenicol	12248505	4
Sanacorp	Chloramphenicol	12248501	1
Caelo	Chloramphenicol	12248506	8
Caelo	Chloramphenicol	12248507	10
Sanacorp	Chloramphenicol	12248507	1
Caelo	Chloramphenicol	12248509	14
AHD	Chloramphenicol	12248507	1
Noweda	Chloramphenicol	12248509	1
Phönix 11.11.2014	Chloramphenicol	12448509	1
EuRho/Phönix	Chloramphenicol	123012-01	1
Fagron	Chloramphenicol	12A11-N02	1
Noweda	Chloramphenicol	12B13-N06	1
Fagron	Chloramphenicol	12G02-N01	11
Fagron	Chloramphenicol	12F01-N23	1
Caelo	Chloramphenicol	12G02-N01	2
Caelo	Chloramphenicol	12g02n01	1
Noweda	Chloramphenicol	12G02-N01	1
Fagron	Chloramphenicol	12L11-N06	10
Phönix	Chloramphenicol	1302024-01	1
Caelo	Chloramphenicol	1302024-01	1
Anzag	Chloramphenicol	1302024-01	1
Caelo	Chloramphenicol	1302024-02	2
Caelo	Chloramphenicol	130416-1	1
Caelo	Chloramphenicol	130416-2	1
Euro OTC	Chloramphenicol	1302034-01	1
Euro OTC	Chloramphenicol		2
Caelo	Chloramphenicol	13080902	1
Phoenix	Chloramphenicol	13080903	1
Phönix	Chloramphenicol	13A11-N02	5
Fagron	Chloramphenicol	13A11N02	1
FARGON	Chloramphenicol	13a11-n02	1
ADH, 11.10.2013	Chloramphenicol	13A11-N02	1
Caelo	Chloramphenicol	13A31-B02	1
Fagron	Chloramphenicol	13A31-B02-286708	1
Phönix	Chloramphenicol	1436907	1
Euro OTC	Chloramphenicol	1509211259	1
Caelo	Chloramphenicol	28011401	1

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Supplier	Substance	Batch	Spectra
Caelo	Chloramphenicol	20102012J1	1
Euro OTC	Chloramphenicol	2121211203012-0	1
Caelo	Chloramphenicol	3125204	1
Sanacorp	Chloramphenicol	41/AKD23	1
Caelo	Chloramphenicol	4712Q-01259	1
Gatt-Koller / Phoenix	Chloramphenicol	5615/12115211	1
Caelo	Chloramphenicol	DY00911233	1
Northeast Gen	Chloramphenicol	DY122127	1
Caelo	Chloramphenicol	70777297	1
Caelo	Chloramphenicol	11/14-N03	2
EUro/AHD	Chloramphenicol	1209019-01	1
EUro/AHD	Chloramphenicol	1209019-02	1
AHD	Chloramphenicol	12248509	1
Fragon	Chloramphenicol	12G02-N01	1
Fagron	Chloramphenicol	1G02N01	1
GEHE	Chloramphenicol	21022141/2	1

- 76 270 spectra from 463 *Apo-Ident* customers from a total of 25 369 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Chloramphenicol* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Chloramphenicol* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	450	0	71 983
Type B	0	355	0	161 718
Type C	0	883	6	76 270

The substance/substance group *Chloramphenicol* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9887 %)	100.0000 % (> 98.6667 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 98.3099 %)
Type C	100.0000 % (> 99.8849 %)	99.3251 % (> 98.9876 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

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Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20777	20777	0.00	39.37
20787	21701	11.52	36.07
20807	22367	7.77	36.85
20813	20777	1.93	39.10
20822	20777	2.16	38.94
21701	21701	0.00	36.28
21752	22367	8.47	38.86
21910	22367	4.08	38.00
21988	21701	5.55	35.71
22367	22367	0.00	38.02

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Chlorhexidine diacetate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20989-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Chlorhexidine diacetate; Chlorhexidini acetas; Chlorhexidinum aceticum

Special notes

When selecting the *Chlorhexidine diacetate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Chlorhexidine diacetate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Chlorhexidine di…	12142726	20989	40	1402685
Caelo	Chlorhexidine di…	12142727	21041	40	20120711
Fagron	Chlorhexidine di…	14I08-B02-306223	22280	40	20140922
Caelo	Chlorhexidine di…	154389	22456	40	20160309*
Caelo	Chlorhexidine di…	15438914	22900	40	1704392

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Chlorhexidine di…	15J02-B08-322916	22947	40	20151104
Caelo	Chlorhexidine di…	15438913	23041	40	20160309*
Caelo	Chlorhexidine di…	154389	23042	40	20160309*
Caelo	Chlorhexidine di…	154389	23043	40	20160309*
Caelo	Chlorhexidine di…	15438909	23044	40	20160309*
Caelo	Chlorhexidine di…	154389	23048	40	20160309*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 440 spectra of 11 reference samples from the substance/substance group *Chlorhexidine diacetate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 8 different batches.

- 71 993 spectra from a total of 1574 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 240 spectra from 7 reference samples of the substance/substance group *Chlorhexidine diacetate*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Chlorhexidine diacetate	09113914	20141	40
Fagron	Chlorhexidine diacetate	14I08-B02-306223	22280†	20
Caelo	Chlorhexidine diacetate	154389	22456†	20

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*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Chlorhexidine diacetate	15J02-B08-322916	22946	40
Caelo	Chlorhexidine diacetate	15438914	22951	40
Caelo	Chlorhexidine diacetate	152610	23045	40
Caelo	Chlorhexidine diacetate	171858	23640	40

- 161 833 spectra from a total of 3492 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 323 spectra from 183 *Apo-Ident* customers from 81 batches from the substance/substance group *Chlorhexidine diacetate*.

- These include spectra of independent samples from 76 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Chlorhexidine diacetate	1072015C	1
Caelo	Chlorhexidine diacetate	9113904	3
Caelo	Chlorhexidine diacetate	11204406	2
Caelo	Chlorhexidine diacetate	12142725	9
keine Angabe	Chlorhexidine diacetate	11204402	2
Caelo	Chlorhexidine diacetate	12142726	9
Caelo	Chlorhexidine diacetate	12142727	9
Noweda	Chlorhexidine diacetate	12142727	1
Caelo	Chlorhexidine diacetate	12142734	12
Großhandel	Chlorhexidine diacetate	12142734	1
Phoenix	Chlorhexidine diacetate	12142734	1
GEHE	Chlorhexidine diacetate	12142734	1
Caelo	Chlorhexidine diacetate	12177503	3
Caelo	Chlorhexidine diacetate	13177001	7
Caelo	Chlorhexidine diacetate	1317021	1
Caelo	Chlorhexidine diacetate	13177002	14
Cealo	Chlorhexidine diacetate	13177002	2
Caelo	Chlorhexidine diacetate	13177007	19
Phoenix	Chlorhexidine diacetate	13177002	1
Medichem S.A. ES/Noweda	Chlorhexidine diacetate	13177007	1
Caelo	Chlorhexidine diacetate	13177008	2
Fagron	Chlorhexidine diacetate	13177008	1
Caelo	Chlorhexidine diacetate	13177009	3
Caelo	Chlorhexidine diacetate	13177021	15
Caelo	Chlorhexidine diacetate	13177024	5
Caelo	Chlorhexidine diacetate	13177022	2
Fagron	Chlorhexidine diacetate	13E03-B06-287926	2

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[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Supplier	Substance	Batch	Spectra
Caelo	Chlorhexidine diacetate	15261003	8
Euro OTC	Chlorhexidine diacetate	15261004	1
Caelo	Chlorhexidine diacetate	15261004	1
Caelo	Chlorhexidine diacetate	15261005	5
Caelo	Chlorhexidine diacetate	15261007	14
Caelo	Chlorhexidine diacetate	15261009	12
Caelo	Chlorhexidine diacetate	15261012	4
Caelo	Chlorhexidine diacetate	15261014	16
caesar	Chlorhexidine diacetate	15261014	1
Caelo	Chlorhexidine diacetate	15438902	5
Wepa/Wepa	Chlorhexidine diacetate	15438902	1
Caelo	Chlorhexidine diacetate	15438903	7
Caelo	Chlorhexidine diacetate	15438909	1
Caelo	Chlorhexidine diacetate	15438911	4
Caelo	Chlorhexidine diacetate	15438914	2
Caelo	Chlorhexidine diacetate	15438917	5
phönix	Chlorhexidine diacetate	15438911	1
Phoenix	Chlorhexidine diacetate	15438917	1
Phönix	Chlorhexidine diacetate	15438917	1
Caelo	Chlorhexidine diacetate	17185802	1
Caelo	Chlorhexidine diacetate	17185807	1
Caelo	Chlorhexidine diacetate	17185808	1
Caelo	Chlorhexidine diacetate	17185811	1
Caelo	Chlorhexidine diacetate	23012015D	1
Euro OTC	Chlorhexidine diacetate	1785805	1
Sanacorp	Chlorhexidine diacetate		1
Caelo	Chlorhexidine diacetate	17188504	1
Caelo	Chlorhexidine diacetate	9113903	1
Caelo	Chlorhexidine diacetate	31032014B	1
Sanacorp	Chlorhexidine diacetate	7/AKD6	1
Phönix	Chlorhexidine diacetate	9113916	2
Caelo	Chlorhexidine diacetate	10154407	1
Caelo	Chlorhexidine diacetate	10154412	1
Caelo	Chlorhexidine diacetate	10154424	1
Caelo	Chlorhexidine diacetate	10154417	1
Euro OTC	Chlorhexidine diacetate	10154430	1
Caelo	Chlorhexidine diacetate	10154429	1
Caelo	Chlorhexidine diacetate	10154421	1
ANZAG am 15.05.2012	Chlorhexidine diacetate	11204401	2
Caelo	Chlorhexidine diacetate	1091139389	1
Caelo	Chlorhexidine diacetate	11204401	3
Caelo	Chlorhexidine diacetate	11204405	1
Anzag 17.07.2012	Chlorhexidine diacetate	11204405	1
Phoenix	Chlorhexidine diacetate	11204408	1
Caelo	Chlorhexidine diacetate	11204407	1
Caelo	Chlorhexidine diacetate	11204408	3
Fagron	Chlorhexidine diacetate	11L28N02	1
Caelo	Chlorhexidine diacetate	12142702	3
phoenix	Chlorhexidine diacetate	12142704	1
Caelo	Chlorhexidine diacetate	12142704	6
Caesar&loretz,Anzag	Chlorhexidine diacetate	12142704	1
Caelo	Chlorhexidine diacetate	12142704ok	1
Caelo	Chlorhexidine diacetate	12142705	3
Caelo	Chlorhexidine diacetate	12142709	1
Caelo	Chlorhexidine diacetate	12142715	3
Caelo	Chlorhexidine diacetate	12142720	11
Noweda	Chlorhexidine diacetate	12142720	1
Caesar & Loretz GmbH, 4...	Chlorhexidine diacetate	12142720	1
Sanacorp	Chlorhexidine diacetate	12142726	1
Phoenix	Chlorhexidine diacetate	12142726	1

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Supplier	Substance	Batch	Spectra
Sanacorp	Chlorhexidine diacetate	12142734	1
Caelo	Chlorhexidine diacetate	12177502	1
Caelo	Chlorhexidine diacetate	12177504	1
Großhandel	Chlorhexidine diacetate	12177505	1
Caelo	Chlorhexidine diacetate	12177505	6
Caelo	Chlorhexidine diacetate	12177510	10
Alliance Healthcare	Chlorhexidine diacetate	12177510	1
Caelo	Chlorhexidine diacetate	1242720	1
Caelo	Chlorhexidine diacetate	123456	1
phönix	Chlorhexidine diacetate		1
Caelo	Chlorhexidine diacetate	1602211263	1
Ceasar & Loretz GmbH	Chlorhexidine diacetate	80104278	1
Caelo	Chlorhexidine diacetate	91139389	1
Fagron	Chlorhexidine diacetate	1-8991-1-01-01	1
Anzag	Chlorhexidine diacetate	70558377	1
Fagron	Chlorhexidine diacetate	A-130037	1
Sanacorp	Chlorhexidine diacetate	12142709	1
Phönix	Chlorhexidine diacetate	Retest09113916	1
Fiebig	Chlorhexidine diacetate	12C19-N02	1
Fagron	Chlorhexidine diacetate	12E14-N11	1
Anzag	Chlorhexidine diacetate	12177505	1
Caelo	Chlorhexidine diacetate	1214726	1

- 76 836 spectra from 463 *Apo-Ident* customers from a total of 25 468 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Chlorhexidine diacetate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Chlorhexidine diacetate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	440	0	71 993
Type B	0	240	0	161 833
Type C	0	317	6	76 836

The substance/substance group *Chlorhexidine diacetate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9887 %)	100.0000 % (> 98.6364 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 97.5000 %)
Type C	100.0000 % (> 99.8850 %)	98.1424 % (> 97.2136 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20989	20989	0.00	26.02
21041	20989	7.23	26.26
22280	20989	7.79	26.11
22456	22456	0.00	26.94
22900	22900	0.00	27.31
22947	20989	4.93	26.05
23041	23041	0.00	26.14
23042	23042	0.00	26.20
23043	23043	0.00	26.28
23044	23044	0.00	26.29
23048	23048	0.00	26.36

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Chlorhexidine dihydrochloride**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20198-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Chlorhexidine dihydrochloride; Chlorhexidini dihydrochloridum; Chlorhexidinum dihydrochloricum

Special notes

When selecting the *Chlorhexidine dihydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Chlorhexidine dihydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Chlorhexidine di…	14A09-B03-290724	21225	40	AR-15-FG-012308-01
Fagron	Chlorhexidine di…	16C11-B02-322510	23209	40	20160412
Fagron	Chlorhexidine di…	16C11-B02-329881	23230	40	20160412

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Chlorhexidine dihydrochloride*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 80 spectra from 2 reference samples of the substance/substance group *Chlorhexidine dihydrochloride*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Chlorhexidine dihydrochloride	10B02-N06	20198	40
Fagron	Chlorhexidine dihydrochloride	16C11-B02-324203	22805	40

- 161 993 spectra from a total of 3497 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

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- 2 spectra from 2 *Apo-Ident* customers from 2 batches from the substance/substance group *Chlorhexidine dihydrochloride*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Chlorhexidine dihydrochloride	14A09B03	1
Fagron	Chlorhexidine dihydrochloride	14A09-B03-293425	1

- 77 157 spectra from 463 *Apo-Ident* customers from a total of 25 545 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Chlorhexidine dihydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Chlorhexidine dihydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	40	40	161 993
Type C	0	1	1	77 157

The substance/substance group *Chlorhexidine dihydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	50.0000 % (> 46.2500 %)
Type C	100.0000 % (> 99.8856 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21225	21225	0.00	33.09
23209	21225	3.28	32.87
23230	21225	3.78	32.80

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Chlorocresol**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20185-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Chlorocresol; Chlorocresolum

Special notes

When selecting the *Chlorocresol* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Chlorocresol*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Chlorocresol	13275106	21512	40	20130828
Caelo	Chlorocresol	13275106	21513	40	20130828
Caelo	Chlorocresol	163378	23357	40	20170124*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Chlorocresol*. These samples are listed above in the section *calibration samples*. The reference samples originate from 2 different batches.

- 72 313 spectra from a total of 1580 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 210 spectra from 6 reference samples of the substance/substance group *Chlorocresol*.

- These include spectra of independent samples from 4 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Chlorocresol	09282613	20185	50
Caelo	Chlorocresol	1211107	21306	40
Caelo	Chlorocresol	13275106	21512†	20
Caelo	Chlorocresol	13275106	21513†	20
Caelo	Chlorocresol	15114107	23411	40
Caelo	Chlorocresol	181360	24050	40

- 161 863 spectra from a total of 3494 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B*

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 18 spectra from 15 *Apo-Ident* customers from 10 batches from the substance/substance group *Chlorocresol*.

- These include spectra of independent samples from 10 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Chlorocresol	2041513	1
Caelo	Chlorocresol	12111013	3
Caelo	Chlorocresol	12111017	2
Caelo	Chlorocresol	13275117	1
Caesar & Loretz GmbH	Chlorocresol	12111017	1
Caelo	Chlorocresol	4613M-01260	1
Caelo	Chlorocresol	7061304	1
Caelo	Chlorocresol	15114103	1
Caelo	Chlorocresol	10145239	4
Noweda	Chlorocresol	12111017	1
Caelo	Chlorocresol	23415422	1
GEHE	Chlorocresol	10145219	1

- 77 141 spectra from 463 *Apo-Ident* customers from a total of 25 537 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Chlorocresol* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Chlorocresol* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	198	12	161 863
Type C	0	17	1	77 141

The substance/substance group *Chlorocresol* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	94.2857 % (> 92.8571 %)
Type C	100.0000 % (> 99.8850 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21512	23357	15.47	39.57
21513	23357	17.20	37.06
23357	23357	0.00	28.31

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Chlortetracycline hydrochloride**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20845-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Chlortetracycline hydrochloride; Chlortetracyclini hydrochloridum; Chlortetracyclinum hydrochloricum

Special notes

When selecting the *Chlortetracycline hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Chlortetracycline hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Chlortetracyclin…	12K30-N07	20845	40	1405318
Fagron	Chlortetracyclin…	12K30-N07	21222	40	20121210
Euro OTC	Chlortetracyclin…	1108051-02	21241	40	20111013
Fagron	Chlortetracyclin…	14J08-B07-307742	21877	40	20141029
Euro OTC	Chlortetracyclin…	1604015	22541	40	20160510*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 200 spectra of 5 reference samples from the substance/substance group *Chlortetracycline - hydrochloride*. These samples are listed above in the section *calibration samples*. The reference samples originate from 4 different batches.

- 72 233 spectra from a total of 1578 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 170 spectra from 5 reference samples of the substance/substance group *Chlortetracycline - hydrochloride*.

- These include spectra of independent samples from 4 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Chlortetracycline hydrochlor…	07C27-N01	20119	40
Fagron	Chlortetracycline hydrochlor…	14J08-B07-307742	21877†	20
Euro OTC	Chlortetracycline hydrochlor…	1604015-01	22975	40
Fagron	Chlortetracycline hydrochlor…	16B10-B09-329778	23571	30
Euro OTC	Chlortetracycline hydrochlor…	1803037	24092	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 903 spectra from a total of 3494 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 174 spectra from 87 *Apo-Ident* customers from 52 batches from the substance/substance group *Chlortetracycline hydrochloride*.

- These include spectra of independent samples from 49 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Chlortetracycline hydrochlor…	12K30-N07	11
Euro OTC	Chlortetracycline hydrochlor…	1412008-02	13
Nachprüfung	Chlortetracycline hydrochlor…	1108051-01	3
Nachprüfung 2574	Chlortetracycline hydrochlor…	1108051-01	1
Euro	Chlortetracycline hydrochlor…	1108051-02	1
Phoenix	Chlortetracycline hydrochlor…	110805102	1
Phönix	Chlortetracycline hydrochlor…	1108051-02	2
Fagron	Chlortetracycline hydrochlor…	13/11-N07	5
Fagron	Chlortetracycline hydrochlor…	13K26-N06	6
Euro OTC	Chlortetracycline hydrochlor…	1412008-01	5
Fiebig	Chlortetracycline hydrochlor…	1412008-01	1
Caelo	Chlortetracycline hydrochlor…	1412008-01	1
Sanacop	Chlortetracycline hydrochlor…	1412008-02	1
Euro OTC	Chlortetracycline hydrochlor…	141200802	2
Caelo	Chlortetracycline hydrochlor…	1412008-02	1
Caelo	Chlortetracycline hydrochlor…	141200802	1
Euro OTC	Chlortetracycline hydrochlor…	1412008-03	3
Fagron	Chlortetracycline hydrochlor…	14J08-B07	4
Caelo	Chlortetracycline hydrochlor…	141200803	1
Fagron	Chlortetracycline hydrochlor…	14j08-b07-300247	1
Fagron	Chlortetracycline hydrochlor…	14J08-B07-300247	2
Caelo	Chlortetracycline hydrochlor…	14J08-B07-300249	1
Fagron	Chlortetracycline hydrochlor…	14J08-B07-300250	9
Fagron	Chlortetracycline hydrochlor…	14J08B07300250	1
Fagron	Chlortetracycline hydrochlor…	14J08-B07-303352	4
Fagron	Chlortetracycline hydrochlor…	14J08-B07-303351	4
Fagron	Chlortetracycline hydrochlor…	14J08-B07-303350	1
Fagron	Chlortetracycline hydrochlor…	14J08B07307100	3
Fagron	Chlortetracycline hydrochlor…	14J08-B07-307100	6
Caelo	Chlortetracycline hydrochlor…	14J08-B07-303352	1
Caelo	Chlortetracycline hydrochlor…	14j08-B07-307742	1
Fagron	Chlortetracycline hydrochlor…	14J08-B07-307742	1
Fagron	Chlortetracycline hydrochlor…	14J156-0002	1
Euro OTC	Chlortetracycline hydrochlor…	1604015-01	5
EuRo/Phönix	Chlortetracycline hydrochlor…	160401501	1
Fagron	Chlortetracycline hydrochlor…	16B10-B09-318088	4
Caelo	Chlortetracycline hydrochlor…	16B10-B09-318088	3
Gehe	Chlortetracycline hydrochlor…	16B10-B09	1
Fagron	Chlortetracycline hydrochlor…	16B10-B09-322715	1
Gehe	Chlortetracycline hydrochlor…	16B10-B09-322716	1
Gehe	Chlortetracycline hydrochlor…	16B10-B09-322715	1

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Supplier	Substance	Batch	Spectra
Fagron	Chlortetracycline hydrochlor…	16B10-B09-322716	1
Phoenix	Chlortetracycline hydrochlor…	16B10-B09-322716	1
Fagron	Chlortetracycline hydrochlor…	16B10-B09-326865	4
Euro OTC	Chlortetracycline hydrochlor…	4612Q-01155	1
Fagron	Chlortetracycline hydrochlor…	16B10-B09-331443	2
Caelo	Chlortetracycline hydrochlor…	FC13030134	1
Fagron	Chlortetracycline hydrochlor…	FC15100204	1
Fagron	Chlortetracycline hydrochlor…	FC13030134	2
Fagron	Chlortetracycline hydrochlor…	4/AKD6	1
Fagron	Chlortetracycline hydrochlor…	FC11051038	1
Euro OTC	Chlortetracycline hydrochlor…	1108051-01	9
Sanacorp	Chlortetracycline hydrochlor…	1108051-01	1
Euro OTC	Chlortetracycline hydrochlor…	1108051-02	7
Euro OTC	Chlortetracycline hydrochlor…	110805102	1
Fagron	Chlortetracycline hydrochlor…	12C16-N01	3
Noweda	Chlortetracycline hydrochlor…	12c16-n01	1
Caesar & Loretz GmbH	Chlortetracycline hydrochlor…	12C16-N01	1
Krieger	Chlortetracycline hydrochlor…	12C16-No1	1
Anzag: 07.09.12 ek:4.01	Chlortetracycline hydrochlor…	12C16-NO1	1
Fagron	Chlortetracycline hydrochlor…	12H28-N09	7
Fagron	Chlortetracycline hydrochlor…	12H28N09	1
Alliance Healthcare	Chlortetracycline hydrochlor…	12K30-N07	1
Fagron	Chlortetracycline hydrochlor…	12k30-N07	1
Fagron	Chlortetracycline hydrochlor…	12K30-N07	1
Fagron	Chlortetracycline hydrochlor…	13111-N07	1
Fagron	Chlortetracycline hydrochlor…	27121306	1
Euro OTC	Chlortetracycline hydrochlor…	2901009V-03	1
Euro OTC	Chlortetracycline hydrochlor…	5113I01155	1
EUro/AHD	Chlortetracycline hydrochlor…	1108051-02	1
Fagron	Chlortetracycline hydrochlor…	12h28-n09	1
Noweda	Chlortetracycline hydrochlor…	11K25-N13	1

- 76 985 spectra from 463 *Apo-Ident* customers from a total of 25 495 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Chlortetracycline hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Chlortetracycline hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	200	0	72 233
Type B	0	170	0	161 903
Type C	0	167	7	76 985

The substance/substance group *Chlortetracycline hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

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	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 96.4706 %)
Type C	100.0000 % (> 99.8850 %)	95.9770 % (> 94.2529 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20845	20845	0.00	32.05
21222	20845	6.58	34.22
21241	20845	7.36	32.69
21877	22541	7.78	31.36
22541	22541	0.00	27.33

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Cholecalciferol dry concentrate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20921-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Cholecalciferol dry concentrate; Cholecalciferoli pulvis; Cholecalciferolum pulveratum

Special notes

When selecting the *Cholecalciferol dry concentrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Cholecalciferol dry concentrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Cholecalciferol ...	1210051-01	20921	40	1403341
Euro OTC	Cholecalciferol ...	1502021-01	21914	40	20150309
Euro OTC	Cholecalciferol ...	1508032	21949	40	20150901*
Euro OTC	Cholecalciferol ...	1701053	23007	40	20170208*
Euro OTC	Cholecalciferol ...	1801038	23965	40	20180206*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 200 spectra of 5 reference samples from the substance/substance group *Cholecalciferol dry concentrate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 5 different batches.

- 72 233 spectra from a total of 1577 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 280 spectra from 8 reference samples of the substance/substance group *Cholecalciferol dry concentrate*.

- These include spectra of independent samples from 6 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Cholecalciferol dry concentr…	1103005-01	20353	40
Euro OTC	Cholecalciferol dry concentr…	1304016-02	21240	40
Euro OTC	Cholecalciferol dry concentr…	1502021-01	21914†	20
Euro OTC	Cholecalciferol dry concentr…	1508032	21949†	20
Euro OTC	Cholecalciferol dry concentr…	1602019	22504	40
Euro OTC	Cholecalciferol dry concentr…	1608002	22749	40
Euro OTC	Cholecalciferol dry concentr…	1707027	23740	40
Euro OTC	Cholecalciferol dry concentr…	1802014	23944	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 793 spectra from a total of 3491 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 8 spectra from 6 *Apo-Ident* customers from 7 batches from the substance/substance group *Cholecalciferol dry concentrate*.

- These include spectra of independent samples from 5 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Euro OTC	Cholecalciferol dry concentr…	1012025-01	1
Euro OTC	Cholecalciferol dry concentr…	1502021-01	1
Caelo	Cholecalciferol dry concentr…	1602019-01	1
Euro OTC	Cholecalciferol dry concentr…	L1403012-01	1
Euro OTC	Cholecalciferol dry concentr…	1210051-01	2
Euro OTC	Cholecalciferol dry concentr…	P500238	1
Euro OTC	Cholecalciferol dry concentr…	1304016-01	1

- 77 151 spectra from 463 *Apo-Ident* customers from a total of 25 540 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Cholecalciferol dry concentrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Cholecalciferol dry concentrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	200	0	72 233
Type B	0	266	14	161 787
Type C	0	7	1	77 151

The substance/substance group *Cholecalciferol dry concentrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9928 %)	95.0000 % (> 93.9286 %)
Type C	100.0000 % (> 99.8851 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20921	20921	0.00	41.29
21914	21949	1.76	28.99
21949	21949	0.00	28.54
23007	23007	0.00	41.63
23965	23965	0.00	38.45

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Cholesterol**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20446-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Cholesterol; Cholesterinum; Cholesterolum

Special notes

When selecting the *Cholesterol* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Cholesterol*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Cholesterol	13F10-B40	21219	40	20131223
Caelo	Cholesterol	160444	22461	40	20160222*
Fagron	Cholesterol	15J23-B03-325106	22971	20	20151103
Caelo	Cholesterol	16044415	23760	40	1804387
Fagron	Cholesterol	17E17-B05-339074	23937	40	20170620

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 180 spectra of 5 reference samples from the substance/substance group *Cholesterol*. These samples are listed above in the section *calibration samples*. The reference samples originate from 5 different batches.

- 72 253 spectra from a total of 1577 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 240 spectra from 7 reference samples of the substance/substance group *Cholesterol*.

- These include spectra of independent samples from 5 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Cholesterol	10315-N07	20446	40
Caelo	Cholesterol	11242104	20459	40
Fagron	Cholesterol	08L09-N01	20510	40
Caelo	Cholesterol	13148703	21310	40
Caelo	Cholesterol	160444	22461†	20
Fagron	Cholesterol	15J23-B03-325106	22971†	20
Fagron	Cholesterol	16G05-B03-331396	23522	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 833 spectra from a total of 3492 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 57 spectra from 33 *Apo-Ident* customers from 39 batches from the substance/substance group *Cholesterol*.

- These include spectra of independent samples from 37 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Cholesterol	13C25-N12	2
Fagron	Cholesterol	14B27-B05-293548	2
Fagron	Cholesterol	13F10-B40-289016	2
Fagron	Cholesterol	13F10-B40	1
Fagron	Cholesterol	14G04-B02-300830	1
Caelo	Cholesterol	12248403	1
Caelo	Cholesterol	15358801	5
Fagron	Cholesterol	12I13-N02	2
Fagron	Cholesterol	14B27-B05	1
Fagron	Cholesterol	15G31-B05-312377	1
Caelo	Cholesterol	15407101	2
Fagron	Cholesterol	15B09-B02-308259	2
Fagron	Cholesterol	15J23-B03-320483	2
Caelo	Cholesterol	15J23-B03	1
Caelo	Cholesterol	15B09-B02-308259	1
Fagron	Cholesterol	15G31-B05-312378	1
Fagron	Cholesterol	15J23-B03-325106	1
Fagron	Cholesterol	13G10-N11	3
Fagron	Cholesterol	8J28-N10	1
Fagron	Cholesterol	10H24-N06	1
Fagron	Cholesterol	11A17-N07	1
Caelo	Cholesterol	13148704	1
Caelo	Cholesterol	11242103	1
Caelo	Cholesterol	14122501	2
Caelo	Cholesterol	15028303	1
Caelo	Cholesterol	14208602	1
Fagron	Cholesterol	2013U-01270	1
Fagron	Cholesterol	14G04-B02	1
Caelo	Cholesterol	15407102	1
Fagron	Cholesterol	15B09-B02	1
Ebert-Jacobi	Cholesterol	16044408	1
Fagron	Cholesterol	15G31-B05	2
Fagron	Cholesterol	15G31-B05-316721	1
Caelo	Cholesterol	15G31-B05-312376	1
Caelo	Cholesterol	16044408	1
Fagron	Cholesterol		1
Caelo	Cholesterol	12155605	1
Phönix, 23.05.2013	Cholesterol	12155605	1
Fagron	Cholesterol	12D02-N10	1
Caelo	Cholesterol	14027201	1
Fagron	Cholesterol	10B15-N07	1
Caelo	Cholesterol	13056903	1

- 77 102 spectra from 463 *Apo-Ident* customers from a total of 25 508 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Cholesterol* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Cholesterol* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	180	0	72 253
Type B	0	240	0	161 833
Type C	0	53	4	77 102

The substance/substance group *Cholesterol* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.6667 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 97.5000 %)
Type C	100.0000 % (> 99.8850 %)	92.9825 % (> 87.7193 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21219	23760	4.07	39.21
22461	22461	0.00	48.05
22971	23760	3.01	37.63
23760	23760	0.00	37.51
23937	23760	15.33	28.99

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Choline chloride**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	22639-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Choline chloride; Cholinii chloridum

Special notes

When selecting the *Choline chloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Choline chloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Choline chloride	162092	22639	40	20160801*
Caelo	Choline chloride	14273819	22663	40	20141002
Caelo	Choline chloride	16209209	23582	40	20160801

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Choline chloride*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 70 spectra from 2 reference samples of the substance/substance group *Choline chloride*.

- These include spectra of independent samples from 1 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Choline chloride	14273819	22734	40
Caelo	Choline chloride	172053	23618	30

- 162 003 spectra from a total of 3497 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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- 0 spectra from 0 *Apo-Ident* customers from 0 batches from the substance/substance group *Choline chloride*.

- These include spectra of independent samples from 0 batches, of which no spectra have been used for the generation of the database.

- 77 159 spectra from 463 *Apo-Ident* customers from a total of 25 547 batches from a further 701 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Choline chloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Choline chloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	70	0	162 003
Type C	0	0	0	77 159

The substance/substance group *Choline chloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 91.4286 %)
Type C	100.0000 % (> 99.8849 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
22639	22639	0.00	107.71
22663	22639	12.54	107.59
23582	22639	8.69	107.99

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Choline hydrogen tartrate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20719-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Choline hydrogen tartrate; Cholinii hyrogenotartras; Cholinium bitartaricum

Special notes

When selecting the *Choline hydrogen tartrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Choline hydrogen tartrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Choline hydrogen…	1603044	22549	40	20160429*
Euro OTC	Choline hydrogen…	1607020	22689	40	20160808*
Euro OTC	Choline hydrogen…	1603044-01	23010	40	20160429
Euro OTC	Choline hydrogen…	1702005	23130	40	20170307*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 4 reference samples from the substance/substance group *Choline hydrogen tartrate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 4 different batches.

- 72 273 spectra from a total of 1578 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 280 spectra from 7 reference samples of the substance/substance group *Choline hydrogen tartrate*.

- These include spectra of independent samples from 6 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Dr. Behr	Choline hydrogen tartrate	WE-11030077-01	20427	40
Euro OTC	Choline hydrogen tartrate	L1208016-01	20719	40
Euro OTC	Choline hydrogen tartrate	L1208016-02	21242	40
Euro OTC	Choline hydrogen tartrate	1603044-01	23101	40
Euro OTC	Choline hydrogen tartrate	1707023	23610	40
Euro OTC	Choline hydrogen tartrate	1711022	23903	40
Euro OTC	Choline hydrogen tartrate	1802008	23958	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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- 161 793 spectra from a total of 3492 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 13 spectra from 3 *Apo-Ident* customers from 7 batches from the substance/substance group *Choline hydrogen tartrate*.

- These include spectra of independent samples from 6 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Euro OTC	Choline hydrogen tartrate	1309023-01	3
Euro OTC	Choline hydrogen tartrate	1303021-01	2
Euro OTC	Choline hydrogen tartrate	1501024-01	3
Euro OTC	Choline hydrogen tartrate	1405017-01	1
Euro OTC	Choline hydrogen tartrate	1603044-01	1
Euro OTC	Choline hydrogen tartrate	1607020-01	2
Euro OTC	Choline hydrogen tartrate	L1208016-01	1

- 77 146 spectra from 463 *Apo-Ident* customers from a total of 25 540 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Choline hydrogen tartrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Choline hydrogen tartrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	72 273
Type B	0	239	41	161 793
Type C	0	13	0	77 146

The substance/substance group *Choline hydrogen tartrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9928 %)	85.3571 % (> 84.2857 %)
Type C	100.0000 % (> 99.8850 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
22549	22549	0.00	60.28
22689	22689	0.00	60.12
23010	22549	2.70	60.31
23130	23130	0.00	53.48

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Ciclopirox olamine**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20601-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Ciclopirox olamine; Aminoaethanolum Ciclopiroxi; Ciclopirox olaminum

Special notes

When selecting the *Ciclopirox olamine* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Ciclopirox olamine*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Ciclopirox olamine	13A16-N04	21218	40	20130117
Caelo	Ciclopirox olamine	13343209	21298	40	AR-15-FG-016214-01
Caelo	Ciclopirox olamine	14147406	21655	40	AR-15-FG-014857-01
Fagron	Ciclopirox olamine	14F13-B03-302340	21964	40	1608170
Caelo	Ciclopirox olamine	14378809	21991	40	20150227

continued on the next page

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Ciclopirox olamine	15364408	23011	40	20151201
Fagron	Ciclopirox olamine	16G26-B02-324884	23108	40	20160907
Caelo	Ciclopirox olamine	14147406	21655SI	40	AR-15-FG-014857-01
Fagron	Ciclopirox olamine	14F13-B03-302340	21964SI	40	1608170
Caelo	Ciclopirox olamine	14378809	21991SI	40	20150227
Caelo	Ciclopirox olamine	15364408	23011SI	40	20151201

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 440 spectra of 11 reference samples from the substance/substance group *Ciclopirox olamine*. These samples are listed above in the section *calibration samples*. The reference samples originate from 7 different batches.

- 71 993 spectra from a total of 1575 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 520 spectra from 15 reference samples of the substance/substance group *Ciclopirox olamine*.

- These include spectra of independent samples from 5 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Ciclopirox olamine	zu erfassen	20558	40
Fagron	Ciclopirox olamine	12B22-N03	20585	40
Caelo	Ciclopirox olamine	12040904	20601	40
Caelo	Ciclopirox olamine	12040906	20648	40
Fagron	Ciclopirox olamine	14E21-M04	21594	60
Caelo	Ciclopirox olamine	14147406	21655†	20
Fagron	Ciclopirox olamine	14F13-B03-302340	21964†	20
Caelo	Ciclopirox olamine	14378809	21991†	20

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Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Ciclopirox olamine	16G26-B02-324884	22969	40
Fagron	Ciclopirox olamine	14E21-M04	21594SI	60
Caelo	Ciclopirox olamine	14147406	21655SI†	20
Fagron	Ciclopirox olamine	14F13-B03-302340	21964SI†	20
Caelo	Ciclopirox olamine	14378809	21991SI†	20
Fagron	Ciclopirox olamine	16G26-B02-324884	22969SI	40
Fagron	Ciclopirox olamine	16G26-B02-324884	23108SI	40

- 161 553 spectra from a total of 3491 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 94 spectra from 37 *Apo-Ident* customers from 47 batches from the substance/substance group *Ciclopirox olamine*.

- These include spectra of independent samples from 43 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Ciclopirox olamine	13343201	2
Caelo	Ciclopirox olamine	13343205	2
Caelo	Ciclopirox olamine	13343207	1
Caelo	Ciclopirox olamine	13343203	1
Caelo	Ciclopirox olamine	13343208	5
Caelo	Ciclopirox olamine	13343209	3
Caelo	Ciclopirox olamine	14147402	5
Cealo	Ciclopirox olamine	14147403	2
Caelo	Ciclopirox olamine	14147405	2
Caelo	Ciclopirox olamine	14275801	2
Caelo	Ciclopirox olamine	14275802	2
Caelo	Ciclopirox olamine	14378801	3
Caelo	Ciclopirox olamine	14378802	1
Caelo	Ciclopirox olamine	14378803	1
Caelo	Ciclopirox olamine	14378804	2
Caelo	Ciclopirox olamine	14378805	2
Caelo	Ciclopirox olamine	14378806	2
Caelo	Ciclopirox olamine	14378809	1
Caelo	Ciclopirox olamine	14378810	2
Fagron	Ciclopirox olamine	14E21-M05	1
Gehe	Ciclopirox olamine	14E21-M04	1
Fagron	Ciclopirox olamine	14F13-B03-302339	1
Caelo	Ciclopirox olamine	15364401	1
Caelo	Ciclopirox olamine	15018802	2

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†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Supplier	Substance	Batch	Spectra
Caelo	Ciclopirox olamine	15364402	2
Caelo	Ciclopirox olamine	15018803	1
Caelo	Ciclopirox olamine	15364405	1
Caelo	Ciclopirox olamine	15364407	3
Caelo	Ciclopirox olamine	15364408	3
Caelo	Ciclopirox olamine	15364412	2
Phoenix	Ciclopirox olamine	15364412	1
Caelo	Ciclopirox olamine	16G26-B02-337355	1
Caelo	Ciclopirox olamine	17118802	1
Sanacorp	Ciclopirox olamine	17118806	1
Caelo	Ciclopirox olamine	17118806	6
Euro OTC	Ciclopirox olamine	17118806	1
Caelo	Ciclopirox olamine	17118808	1
Fagron	Ciclopirox olamine	10L09-N03	1
Noweda	Ciclopirox olamine	12040911	1
Caelo	Ciclopirox olamine	12040903	1
Caelo	Ciclopirox olamine	12040911	2
Fagron	Ciclopirox olamine	11h03-n02	1
Fagron	Ciclopirox olamine	11H03-N02	1
Caelo	Ciclopirox olamine	12040906	1
Cael	Ciclopirox olamine	12040911	2
Noweda	Ciclopirox olamine	12D26-N10	2
Caelo	Ciclopirox olamine	12B22-N03	1
Noweda	Ciclopirox olamine	12B22-N03	1
Fagron	Ciclopirox olamine	12G12-N09	3
Kehr	Ciclopirox olamine	12G12-N09	1
Caelo	Ciclopirox olamine	13343	1
Caelo	Ciclopirox olamine	13343202	1
Fagron	Ciclopirox olamine	G711016	1
Phönix	Ciclopirox olamine	13A16-N04	1
Fagron	Ciclopirox olamine	13A16-N04	1

- 77 065 spectra from 463 *Apo-Ident* customers from a total of 25 500 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Ciclopirox olamine* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ciclopirox olamine* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	440	0	71 993
Type B	0	437	83	161 553
Type C	0	84	10	77 065

The substance/substance group *Ciclopirox olamine* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

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	Specificity	Recognition rate
Type A	100.0000 % (> 99.9887 %)	100.0000 % (> 98.6364 %)
Type B	100.0000 % (> 99.9928 %)	84.0385 % (> 83.4615 %)
Type C	100.0000 % (> 99.8850 %)	89.3617 % (> 86.1702 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21218	21964	8.47	68.53
21298	21298	0.00	67.00
21655	21655	0.00	66.14
21964	21964	0.00	65.00
21991	21298	4.59	65.49
23011	21298	6.63	70.43
23108	21964	5.21	67.61

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Ciclosporin**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	`20941-2018-07-18`
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Ciclosporin; Ciclosporinum

Special notes

When selecting the *Ciclosporin* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Ciclosporin*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Ciclosporin	`13D26-N07`	`20941`	40	`1402057`
Caelo	Ciclosporin	`12317707`	`21082`	40	`20121119`
Caelo	Ciclosporin	`13148604`	`21474`	40	`1412541`
Caelo	Ciclosporin	`13148604`	`21475`	40	`20130613`
Fagron	Ciclosporin	`13D26-N07`	`21671`	40	`1508429`

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 200 spectra of 5 reference samples from the substance/substance group *Ciclosporin*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 233 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 240 spectra from 8 reference samples of the substance/substance group *Ciclosporin*.

- These include spectra of independent samples from 5 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Ciclosporin	10F22-N01	20232	40
Fagron	Ciclosporin	10G07-N03	20281	40
Caelo	Ciclosporin	13148604	21474†	20
Caelo	Ciclosporin	13148604	21475†	20
Fagron	Ciclosporin	13D26-N07	21671†	20
Caelo	Ciclosporin	15278907	22966	40
Fagron	Ciclosporin	16C09-B02-325955	23521	30
Caelo	Ciclosporin	171583	23669	30

- 161 833 spectra from a total of 3492 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 142 spectra from 58 *Apo-Ident* customers from 50 batches from the substance/substance group *Ciclosporin*.

- These include spectra of independent samples from 47 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Ciclosporin	10J18-N06	1
Caelo	Ciclosporin	13148604	1
Caelo	Ciclosporin	13346803	5
Caelo	Ciclosporin	13148606	7
Fagron	Ciclosporin	13414038	5
Caelo	Ciclosporin	13346808	1
Fagron	Ciclosporin	13414092	3
Fagron	Ciclosporin	13A28-N04	5
Fagron	Ciclosporin	13B19-N02	3
Fagron	Ciclosporin	13B19N02	2
Caelo	Ciclosporin	13D26-N07	4
VDL	Ciclosporin	13D26-N07	1
Fagron	Ciclosporin	13D26-N07	9
Fagron	Ciclosporin	14/18-B02-300180	1
Fagron	Ciclosporin	13H19-N09	4
Caelo	Ciclosporin	14199104	4
Fagron	Ciclosporin	13H19N09	1
Fagron	Ciclosporin	14718-b02-300180	1
Fagron	Ciclosporin	14A15-N01	5
Concord Biotech Ltd./ N...	Ciclosporin	14G22-B02-296891	1
Fagron	Ciclosporin	14G22-B02-296891	5
Fagron	Ciclosporin	14a15-n01	1
Caelo	Ciclosporin	15049703	5
Caelo	Ciclosporin	15278901	3
Caelo	Ciclosporin	15278902	2
Caelo	Ciclosporin	15278903	1
Caelo	Ciclosporin	15278904	1
Fagron	Ciclosporin	15D23-B05	2
Fagron	Ciclosporin	15D23-B05-307217	2
Fagron	Ciclosporin	15D23-B05-308853	3
Fagron	Ciclosporin	15f29-b14-316270	2
Fagron	Ciclosporin	15f29-b14-325654	1
Fagron	Ciclosporin	15F29-B14-316270	1
Fagron	Ciclosporin	15F29B14316270	1
Caelo	Ciclosporin	29689114C22B02	1
Fagron	Ciclosporin	16121401	1
Fagron	Ciclosporin	1103531	2
Caelo	Ciclosporin	12165603	2
Caelo	Ciclosporin	12165602	3
Fagron	Ciclosporin	1110532	1
Caelo	Ciclosporin	12317702	6
Caelo	Ciclosporin	123117702	1
Fagron	Ciclosporin	11K17-N13	1

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Supplier	Substance	Batch	Spectra
Caelo	Ciclosporin	12317707	4
Caelo	Ciclosporin	12E31-N02	1
Caelo	Ciclosporin	12317703	1
Fagron	Ciclosporin	12E31-N02	9
Phoenix am 21.01.2013	Ciclosporin	12E31-N02	2
Caelo	Ciclosporin	13031303	1
Fagron	Ciclosporin	13A28-n04	1
Anzag 23.03.13	Ciclosporin	13A28-N04	1
Caelo	Ciclosporin	13A28-N04	4
Phönix	Ciclosporin	13D26-N07	1
Fargon	Ciclosporin	13D26-No7	1
Caelo	Ciclosporin	14A15-No1	1
Caelo	Ciclosporin	19011301	1
Fagron	Ciclosporin	25051302	1
Fagron	Ciclosporin	13d026N07	1

- 77 017 spectra from 463 *Apo-Ident* customers from a total of 25 497 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Ciclosporin* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ciclosporin* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	200	0	72 233
Type B	0	198	42	161 833
Type C	0	114	28	77 017

The substance/substance group *Ciclosporin* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9928 %)	82.5000 % (> 81.2500 %)
Type C	100.0000 % (> 99.8850 %)	80.2817 % (> 78.1690 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

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Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20941	20941	0.00	22.50
21082	21474	11.07	22.34
21474	21474	0.00	20.80
21475	21474	2.08	21.00
21671	21671	0.00	22.78

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Ciprofloxacin hydrochloride**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20945-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Ciprofloxacin hydrochloride; Ciprofloxacini hydrochloridum

Special notes

When selecting the *Ciprofloxacin hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Ciprofloxacin hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Ciprofloxacin hy…	12B08-N03	20945	40	1401421
Fagron	Ciprofloxacin hy…	14B25-B02	21254	40	20140324

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 80 spectra of 2 reference samples from the substance/substance group *Ciprofloxacin hydrochloride*. These samples are listed above in the section *calibration samples*. The reference samples originate from 2 different batches.

- 72 353 spectra from a total of 1580 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 160 spectra from 4 reference samples of the substance/substance group *Ciprofloxacin hydrochloride*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Ciprofloxacin hydrochloride	15D07-B01-312864	22755	40
Fagron	Ciprofloxacin hydrochloride	15D07-B01-312864	23568	40
Fagron	Ciprofloxacin hydrochloride	16B17-B05-341882	23938	40
Fagron	Ciprofloxacin hydrochloride	17K09-B02-345976	23991	40

- 161 913 spectra from a total of 3496 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

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- 7 spectra from 4 *Apo-Ident* customers from 7 batches from the substance/substance group *Ciprofloxacin hydrochloride*.

- These include spectra of independent samples from 7 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Ciprofloxacin hydrochloride	14/15-B08-303363	1
Fagron	Ciprofloxacin hydrochloride	14B25-B02-291783	1
Fagron	Ciprofloxacin hydrochloride	13F13-N03	1
Fagron	Ciprofloxacin hydrochloride	14I15-B08-303363	1
Fagron	Ciprofloxacin hydrochloride	14B25-B02-291-783	1
Fagron	Ciprofloxacin hydrochloride	14I15-B08	1
Fagron	Ciprofloxacin hydrochloride	14l15-B08	1

- 77 152 spectra from 463 *Apo-Ident* customers from a total of 25 540 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Ciprofloxacin hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ciprofloxacin hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	72 353
Type B	0	160	0	161 913
Type C	0	7	0	77 152

The substance/substance group *Ciprofloxacin hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 96.2500 %)
Type C	100.0000 % (> 99.8851 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20945	20945	0.00	48.13
21254	20945	4.88	50.23

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Citric acid monohydrate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20012-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Citric acid monohydrate; Acidum citricum monohydricum

Special notes

When selecting the *Citric acid monohydrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Citric acid monohydrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Citric acid mono…	12D26-N02	20926	40	20120515
Caelo	Citric acid mono…	15185301	22340	40	20150708
Caelo	Citric acid mono…	161865	22617	40	20160706*
Caelo	Citric acid mono…	17085602	23409	40	20170410

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 4 reference samples from the substance/substance group *Citric acid monohydrate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 4 different batches.

- 72 273 spectra from a total of 1578 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 170 spectra from 5 reference samples of the substance/substance group *Citric acid monohydrate*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Citric acid monohydrate	82803249	20012	30
Caelo	Citric acid monohydrate	15185301	22340†	20
Caelo	Citric acid monohydrate	161865	23298	40
Hedinger	Citric acid monohydrate	202029	23457	40
Hedinger	Citric acid monohydrate	202029	23458	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 903 spectra from a total of 3495 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 184 spectra from 62 *Apo-Ident* customers from 62 batches from the substance/substance group *Citric acid monohydrate*.

- These include spectra of independent samples from 60 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Citric acid monohydrate	13069103	2
Caelo	Citric acid monohydrate	13069133	7
Caelo	Citric acid monohydrate	13069125	2
Caelo	Citric acid monohydrate	13069105	3
Caelo	Citric acid monohydrate	14311807	3
Caelo	Citric acid monohydrate	15087512	1
Caelo	Citric acid monohydrate	15185304	12
Caelo	Citric acid monohydrate	15185317	1
Caelo	Citric acid monohydrate	P135/14	1
Caelo	Citric acid monohydrate	13069104	6
Caelo	Citric acid monohydrate	13069113	2
Caelo	Citric acid monohydrate	12125907	7
Caelo	Citric acid monohydrate	12125937	3
Caelo	Citric acid monohydrate	13069111	4
Caelo	Citric acid monohydrate	13069110	4
Caelo	Citric acid monohydrate	13069124	5
Caelo	Citric acid monohydrate	13069128	4
Caelo	Citric acid monohydrate	13069129	4
Caelo	Citric acid monohydrate	13069130	1
Caelo	Citric acid monohydrate	14038401	11
Caelo	Citric acid monohydrate	14038403	7
Caelo	Citric acid monohydrate	14311808	4
Caelo	Citric acid monohydrate	14311812	4
Caelo	Citric acid monohydrate	14311813	1
Caelo	Citric acid monohydrate	15087503	2
Caelo	Citric acid monohydrate	15087509	8
Caelo	Citric acid monohydrate	15087502	3
Caelo	Citric acid monohydrate	15087510	2
Caelo	Citric acid monohydrate	15185301	2
Caelo	Citric acid monohydrate	15185302	7
Caelo	Citric acid monohydrate	2515Q-02959	1
Bombastus	Citric acid monohydrate	287593	1
Krieger	Citric acid monohydrate	613001-1-P	1
Caelo	Citric acid monohydrate	15185309	2
Caelo	Citric acid monohydrate	15185314	3
Caelo	Citric acid monohydrate	15185316	4
Ebert 17.08.16	Citric acid monohydrate	15185314	1
Caelo	Citric acid monohydrate	15185320	1
Caelo	Citric acid monohydrate	15185321	3
Caelo	Citric acid monohydrate	16186501	2
Caelo	Citric acid monohydrate	16186502	1

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Supplier	Substance	Batch	Spectra
Caelo	Citric acid monohydrate	17085603	1
Hedinger	Citric acid monohydrate	202029	2
Bombastus	Citric acid monohydrate	259437	1
Caelo	Citric acid monohydrate	11208130	5
VDL	Citric acid monohydrate	263669	1
Caelo	Citric acid monohydrate	11041413	1
Caelo	Citric acid monohydrate	11208132	5
Phönix	Citric acid monohydrate	10111503	2
Caelo	Citric acid monohydrate	11208133	4
Krämer&Martin	Citric acid monohydrate	11742009053020	1
Fagron	Citric acid monohydrate	11K01-N05	1
Caelo	Citric acid monohydrate	12125904	3
Caesar &Loretz GmbH	Citric acid monohydrate	12125937	1
Caelo	Citric acid monohydrate	12125938	1
Caelo	Citric acid monohydrate	1212937	1
Caelo	Citric acid monohydrate	1215907	1
Sanacorp	Citric acid monohydrate	1215937	1
Caelo	Citric acid monohydrate	1215911	1
Fagron	Citric acid monohydrate	12D26-N02	1
Caelo	Citric acid monohydrate	13069106	3
Fiebig28.08.13 EK6,60	Citric acid monohydrate	13069111	1
Caelo	Citric acid monohydrate	13069126	1
Caelo	Citric acid monohydrate	1306915	1
Azelis	Citric acid monohydrate	TH4120517	1

- 76 975 spectra from 463 *Apo-Ident* customers from a total of 25 486 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Citric acid monohydrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Citric acid monohydrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	160	0	72 273
Type B	0	170	0	161 903
Type C	0	167	17	76 975

The substance/substance group *Citric acid monohydrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 96.4706 %)
Type C	100.0000 % (> 99.8850 %)	90.7609 % (> 89.1304 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several

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new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20926	22617	12.01	54.81
22340	22617	4.41	55.44
22617	22617	0.00	55.33
23409	22617	11.70	55.34

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Citric acid, anhydrous**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20019-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Citric acid, anhydrous; Acidum citricum anhydricum

Special notes

When selecting the *Citric acid, anhydrous* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Citric acid, anhydrous*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Citric acid, anh…	11380204	20682	40	20120127
Caelo	Citric acid, anh…	12043112	20683	40	20120229
Fagron	Citric acid, anh…	12F18-N03	20706	40	20120628
Fagron	Citric acid, anh…	13G24-N13	20913	40	20130827
Caelo	Citric acid, anh…	13396502	21455	40	20140110
Caelo	Citric acid, anh…	13243213	21487	40	20130821
Caelo	Citric acid, anh…	160386	22463	40	20160315*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 280 spectra of 7 reference samples from the substance/substance group *Citric acid, anhydrous*. These samples are listed above in the section *calibration samples*. The reference samples originate from 7 different batches.

- 72 153 spectra from a total of 1575 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 450 spectra from 11 reference samples of the substance/substance group *Citric acid, anhydrous*.

- These include spectra of independent samples from 7 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Citric acid, anhydrous	91584259	20019	70
Caelo	Citric acid, anhydrous	13396502	21455†	20
Caelo	Citric acid, anhydrous	160386	22463†	20
Caelo	Citric acid, anhydrous	160387	22478	60
Caelo	Citric acid, anhydrous	162086	22620	40
Caelo	Citric acid, anhydrous	162154	22622	40
Caelo	Citric acid, anhydrous	171627	23303	40
Caelo	Citric acid, anhydrous	171626	23421	40
Caelo	Citric acid, anhydrous	171626	23648	40
Caelo	Citric acid, anhydrous	171627	23677	40
Caelo	Citric acid, anhydrous	180976	24034	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*).

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- 161 623 spectra from a total of 3490 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 1465 spectra from 348 *Apo-Ident* customers from 394 batches from the substance/substance group *Citric acid, anhydrous*.

- These include spectra of independent samples from 384 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Noweda	Citric acid, anhydrous	10182420	2
Caelo	Citric acid, anhydrous		4
Caelo	Citric acid, anhydrous	13175403	20
Caelo	Citric acid, anhydrous	13243213	23
VDL;23.6.14; 2.49EUR	Citric acid, anhydrous	13243213	1
VDL 16.03.15; 2,54EUR	Citric acid, anhydrous	13243201	2
Caelo	Citric acid, anhydrous	13243201	19
Caelo	Citric acid, anhydrous	13243216	13
Caelo	Citric acid, anhydrous	13243218	8
Caelo	Citric acid, anhydrous	13243219	4
Caelo	Citric acid, anhydrous	13243214	17
Bombastus	Citric acid, anhydrous	13396502	1
Caelo	Citric acid, anhydrous	13243229	1
Caelo	Citric acid, anhydrous	13243224	2
Sanacorb;20.04.15; 7,45EUR	Citric acid, anhydrous	1375410	1
Fagron	Citric acid, anhydrous	13K18-B34-291522	4
Euro OTC	Citric acid, anhydrous	13396515	1
Caelo	Citric acid, anhydrous	13396506	1
Caelo	Citric acid, anhydrous	13396515	5
Caelo	Citric acid, anhydrous	14186312	14
Fagron	Citric acid, anhydrous	14E06-B07-293890	3
Fagron	Citric acid, anhydrous	13K18-B34-291519	5
Caelo	Citric acid, anhydrous	15063213	20
Caelo	Citric acid, anhydrous	15063204	7
Caelo	Citric acid, anhydrous	15063003	15
Caelo	Citric acid, anhydrous	1506204	1
Caelo	Citric acid, anhydrous	15087903	13
Caelo	Citric acid, anhydrous	16004701	14
Caelo	Citric acid, anhydrous	16004706	11
Caelo	Citric acid, anhydrous	16038704	10
Caelo	Citric acid, anhydrous	16004705	3
Caelo	Citric acid, anhydrous	16038708	6
Caelo	Citric acid, anhydrous	16038607	2
Euro OTC	Citric acid, anhydrous	L1202001-01	6
Euro OTC	Citric acid, anhydrous	L1408011-02	1
Holdermann	Citric acid, anhydrous	1011047-03	1

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Hence, these spectra are not independent and are not of *Type B*.

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Supplier	Substance	Batch	Spectra
Caelo	Citric acid, anhydrous	10182420	1
Caelo	Citric acid, anhydrous	1155609	2
Caelo	Citric acid, anhydrous	11380204	6
Fagron	Citric acid, anhydrous	1155609	15
Fagron	Citric acid, anhydrous	11K07-N01	10
Gehe	Citric acid, anhydrous	11F29-N03	1
Caelo	Citric acid, anhydrous	12043105	2
Caelo	Citric acid, anhydrous	12156824	12
Caelo	Citric acid, anhydrous	12043111	1
Fagron	Citric acid, anhydrous	12B01-N01	23
Caelo	Citric acid, anhydrous	13050617	13
Sanacorp	Citric acid, anhydrous	12156824	1
Caelo	Citric acid, anhydrous	13050623-3376319052	1
Caelo	Citric acid, anhydrous	12B01-N01	3
Fagron	Citric acid, anhydrous	12b01-N01	1
EuRho/Phönix	Citric acid, anhydrous	L1304042-01	1
Fagron	Citric acid, anhydrous	13A04N04	1
Caelo	Citric acid, anhydrous	13A04-N04	6
Caelo	Citric acid, anhydrous	1072015B	1
Caelo	Citric acid, anhydrous	11178303	3
Fagron	Citric acid, anhydrous	100614d	1
Caelo	Citric acid, anhydrous	11380217	2
Fagron	Citric acid, anhydrous	1156158	1
Fagron	Citric acid, anhydrous	1172673	5
Fagron	Citric acid, anhydrous	11H30-N05	2
Fagron	Citric acid, anhydrous	11C24N022869/4250	1
Caelo	Citric acid, anhydrous	12156811	13
Caelo	Citric acid, anhydrous	12175711	5
Caelo	Citric acid, anhydrous	12175708	3
Caelo	Citric acid, anhydrous	12156832	9
Caelo	Citric acid, anhydrous	12175716	4
Caelo	Citric acid, anhydrous	12175718	1
Caelo	Citric acid, anhydrous	12353613	1
Caesar/Noweda	Citric acid, anhydrous	12B01-N01	2
Klenk	Citric acid, anhydrous	12B01-N01	2
Caelo	Citric acid, anhydrous	13050611	7
Caelo	Citric acid, anhydrous	13031502	1
Caelo	Citric acid, anhydrous	13050610	6
Caelo	Citric acid, anhydrous	13050622	11
Caelo	Citric acid, anhydrous	13061502	1
Caelo	Citric acid, anhydrous	1317504	1
Caelo	Citric acid, anhydrous	13175404	6
Caelo	Citric acid, anhydrous	13175406	3
Caelo	Citric acid, anhydrous	13175409	23
Caelo	Citric acid, anhydrous	13175405	9
anzag	Citric acid, anhydrous	13175409	1
Caelo	Citric acid, anhydrous	13175410	4
Caelo	Citric acid, anhydrous	13175411	12
Caelo	Citric acid, anhydrous	13175426	6
Caelo	Citric acid, anhydrous	13242225	1
Caelo	Citric acid, anhydrous	13243005	1
Caesar & Loretz GmbH	Citric acid, anhydrous	13243201	1
Fiebig	Citric acid, anhydrous	13243201	1
Caelo	Citric acid, anhydrous	13243202	11
Caelo	Citric acid, anhydrous	13243208	2
Caelo	Citric acid, anhydrous	13243210	9
Gehe	Citric acid, anhydrous	13243213	1
Caesar & Loretz GmbH	Citric acid, anhydrous	13243214	1
Sanacorp	Citric acid, anhydrous	13243214	1
Noweda	Citric acid, anhydrous	13243216	1

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Supplier	Substance	Batch	Spectra
Caelo	Citric acid, anhydrous	13243217	7
GEHE 02.07.2014	Citric acid, anhydrous	13243217	1
Caelo	Citric acid, anhydrous	13243221	9
Caelo	Citric acid, anhydrous	13243220	2
Caelo	Citric acid, anhydrous	13243222	2
Caelo	Citric acid, anhydrous	13243225	5
Caelo	Citric acid, anhydrous	13396502	4
AHD	Citric acid, anhydrous	13396502	1
Caelo	Citric acid, anhydrous	13396504	3
sanacorp	Citric acid, anhydrous	13396505	1
Caelo	Citric acid, anhydrous	13396505	2
Phoenix 07.04.2014	Citric acid, anhydrous	13A04-N04	1
Fagron	Citric acid, anhydrous	13A04-N04	15
Phönix Gotha	Citric acid, anhydrous	13A04-N040049-100	1
Fagron	Citric acid, anhydrous	13D29N02	1
Fagron	Citric acid, anhydrous	13F12-N01	3
Fagron	Citric acid, anhydrous	13G04-N05	6
Caelo	Citric acid, anhydrous	13D29-N02	1
Fagron	Citric acid, anhydrous	13F12-N08	2
Caelo	Citric acid, anhydrous	13G24N13	2
Fagron	Citric acid, anhydrous	13G24-N24	12
Fagron	Citric acid, anhydrous	13G24-N240029/900	1
Fagron	Citric acid, anhydrous	13k18b34288373	1
Fagron	Citric acid, anhydrous	13G24-N240739/900	1
Fagron	Citric acid, anhydrous	13K18-B34	8
Fagron	Citric acid, anhydrous	13H22-N09	2
Caelo	Citric acid, anhydrous	13K18-B34	1
Fagron	Citric acid, anhydrous	13K18-B34-288371	4
Caelo	Citric acid, anhydrous	13K18-B34-288371TEST	1
Fagron	Citric acid, anhydrous	13K18-B34-288372	7
Fagron	Citric acid, anhydrous	13K18-B34-288373	2
Caelo	Citric acid, anhydrous	13K18-B34-288372	1
Fagron	Citric acid, anhydrous	13k18-B34-288372	1
Fagron	Citric acid, anhydrous	13K18-B34-291071	4
Großhandel	Citric acid, anhydrous	13K18-B34-291072	1
Fagron	Citric acid, anhydrous	13K18-B34-291072	2
Fagron	Citric acid, anhydrous	13K18-B34-291520	6
Fagron	Citric acid, anhydrous	13K18B34291520	1
Caelo	Citric acid, anhydrous	13K18-B34-291520	1
Caelo	Citric acid, anhydrous	13k18-b34-291522	1
Caelo	Citric acid, anhydrous	13K18-B34-291522	1
Fagron	Citric acid, anhydrous	13K18-B34-291521	4
Fagron	Citric acid, anhydrous	13k18-b34-291522	1
Caelo	Citric acid, anhydrous	13K18-B34-291523	2
Fagron	Citric acid, anhydrous	13K18-B34-291523	1
Fagron	Citric acid, anhydrous	13K18-B34-293871	2
Fagron	Citric acid, anhydrous	13L05-B02-296246	3
Fagron	Citric acid, anhydrous	13L05-B02-309050	1
Fagron	Citric acid, anhydrous	13L18-B39-289347	4
Caelo	Citric acid, anhydrous	14186301	18
Caelo	Citric acid, anhydrous	14041506	1
Caelo	Citric acid, anhydrous	14071501	1
Cealo/Gehe	Citric acid, anhydrous	14186301	6
Caelo	Citric acid, anhydrous	14186302	12
Phönix	Citric acid, anhydrous	14186312	4
Caelo	Citric acid, anhydrous	14186313	4
Caelo	Citric acid, anhydrous	14186314	3
Fagron	Citric acid, anhydrous	14E06-B07293872	1
Caelo	Citric acid, anhydrous	14E06-B07	1
Caelo	Citric acid, anhydrous	14E06-B07-293873	1

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Supplier	Substance	Batch	Spectra
Fagron	Citric acid, anhydrous	14E06-B07	1
Fagron	Citric acid, anhydrous	14E06-B07-293872	3
Gehe Kassel, 22.05.2015	Citric acid, anhydrous	14E06-B07-293872	1
Fagron	Citric acid, anhydrous	14E06-B07-293875	3
Fagron	Citric acid, anhydrous	14b06-b07-293872	1
Fagron	Citric acid, anhydrous	14E06-B07-29389	1
Fagron	Citric acid, anhydrous	14G04-B09-293874	10
Fagron	Citric acid, anhydrous	14G04-b09-293876	1
Fagron	Citric acid, anhydrous	14K05-B04-302816	6
Caelo	Citric acid, anhydrous	14G04-B09-293876	4
Caelo	Citric acid, anhydrous	15044901	6
Fagron	Citric acid, anhydrous	14G04B09296361	1
Fagron	Citric acid, anhydrous	14G04B09293876	1
Caelo	Citric acid, anhydrous	15044902	3
Fagron	Citric acid, anhydrous	15044902	1
Caelo	Citric acid, anhydrous	15044903	5
Caeolo/Gehe	Citric acid, anhydrous	15044903	3
Caelo	Citric acid, anhydrous	15044904	6
Caelo	Citric acid, anhydrous	15063001	1
Caelo	Citric acid, anhydrous	15044905	5
Caesar & Loretz GmbH Hi...	Citric acid, anhydrous	15063003	1
Caesar & Loretz GmbH	Citric acid, anhydrous	15063003	2
Caelo	Citric acid, anhydrous	15063006	4
Caelo	Citric acid, anhydrous	15063205	2
Caelo	Citric acid, anhydrous	15063203	10
Caelo	Citric acid, anhydrous	15063202	1
Caelo	Citric acid, anhydrous	15063206	15
Caelo	Citric acid, anhydrous	15063211	3
AHD	Citric acid, anhydrous	15063218	1
Caelo	Citric acid, anhydrous	15087902	3
Caelo	Citric acid, anhydrous	15087510	1
Caelo	Citric acid, anhydrous	15088016	4
Caelo	Citric acid, anhydrous	15124301	8
Caelo	Citric acid, anhydrous	15124303	2
Caelo	Citric acid, anhydrous	16004702	13
Caesar&Loretz GmbH,16.0...	Citric acid, anhydrous	16004706	1
Caelo	Citric acid, anhydrous	1604701	1
phönix	Citric acid, anhydrous	16038604	3
Fagron	Citric acid, anhydrous	16072014B	1
Fagron	Citric acid, anhydrous	1714Q1024	1
Caelo	Citric acid, anhydrous	16208614	4
Caelo	Citric acid, anhydrous	16208607	7
Caelo	Citric acid, anhydrous	18091409	1
phönix	Citric acid, anhydrous	16208608	1
Caelo	Citric acid, anhydrous	28051401	1
Caelo	Citric acid, anhydrous	42/AKD1	1
Sanacorp	Citric acid, anhydrous	41/AKD4	1
Fischar	Citric acid, anhydrous	6493071	1
Otto Fischer / Sana	Citric acid, anhydrous	6493071	1
Fischar/Noweda	Citric acid, anhydrous	6493051	1
Phönix	Citric acid, anhydrous	43/AKD13	1
Phoenix 07.04.2014	Citric acid, anhydrous	700309-0003	1
Fagron	Citric acid, anhydrous	700309-0003	2
Euro OTC	Citric acid, anhydrous	702260	1
Caelo	Citric acid, anhydrous	7808	1
Euro OTC	Citric acid, anhydrous	L1202001-02	1
Euro OTC	Citric acid, anhydrous	L1408011-01	1
Euro OTC	Citric acid, anhydrous	L1508013-01	2
Euro OTC	Citric acid, anhydrous	L1503027-01	1
Caelo	Citric acid, anhydrous	1015U-01024	1

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Supplier	Substance	Batch	Spectra
Euro OTC	Citric acid, anhydrous	L1503027-02	4
Caelo	Citric acid, anhydrous	1396505	1
Fagron	Citric acid, anhydrous	13L05B02296247	1
Gehe/Fragon	Citric acid, anhydrous	14G04B09293876	1
Fagron	Citric acid, anhydrous	14G04-B09-293876	1
Caelo	Citric acid, anhydrous	14G04B09293877	1
Fagron	Citric acid, anhydrous	14G04-B09-293877	5
Fagron	Citric acid, anhydrous	14G04-B09-309707	1
Fagron	Citric acid, anhydrous	14G04-B09-309836	1
Caelo	Citric acid, anhydrous	14K05-B04-302815	1
Fagron	Citric acid, anhydrous	14K05-B04-302815	2
Caelo	Citric acid, anhydrous	1501-B06-324348	1
Fagron	Citric acid, anhydrous	14K05-B04-302817	1
Ebert & Jacobi 12.07...	Citric acid, anhydrous	1506214	1
Fagron	Citric acid, anhydrous	14k05-b04-302816	1
Jenne	Citric acid, anhydrous	15063002	1
Noweda	Citric acid, anhydrous	15063203	1
Caesar&Loretz GmbH	Citric acid, anhydrous	15063213	1
Caelo	Citric acid, anhydrous	15063214	5
Caelo	Citric acid, anhydrous	15063217	3
Caelo	Citric acid, anhydrous	15063218	9
Noweda	Citric acid, anhydrous	15087902	2
Caesar & Loretz	Citric acid, anhydrous	15087904	2
12.12.2016 Phoenix 4,59EUR	Citric acid, anhydrous	15088008	1
Caelo	Citric acid, anhydrous	15088008	1
Caelo	Citric acid, anhydrous	15088017	2
Phoenix 12.12.2016 4,59EUR	Citric acid, anhydrous	1508808	1
Caelo	Citric acid, anhydrous	1516Q-01024	1
Fagron	Citric acid, anhydrous	15G16-B01	1
Fragron/Noweda	Citric acid, anhydrous	15G16-B01-330449	1
Fagron	Citric acid, anhydrous	15G16B01	1
Fagron	Citric acid, anhydrous	15G16B01330450	1
Fagron	Citric acid, anhydrous	15G16-B01-330449	1
Fagron	Citric acid, anhydrous	15G16-B01-330450	3
Noweda	Citric acid, anhydrous	16004701	1
Caesar & Lorenz GmbH	Citric acid, anhydrous	16004706	1
Caelo	Citric acid, anhydrous	16038602	3
Caelo	Citric acid, anhydrous	16038603	3
Caelo	Citric acid, anhydrous	16038604	6
Caelo	Citric acid, anhydrous	16038606	10
Caelo	Citric acid, anhydrous	16038608	8
Krieger	Citric acid, anhydrous	16038606	1
Caelo	Citric acid, anhydrous	16038613	4
Caelo	Citric acid, anhydrous	16038621	9
Caelo	Citric acid, anhydrous	16038622	2
Caelo	Citric acid, anhydrous	16038701	1
Cealo/AHD	Citric acid, anhydrous	16038704	1
Caelo	Citric acid, anhydrous	16038707	7
Caelo	Citric acid, anhydrous	16038709	4
Caelo	Citric acid, anhydrous	16038712	1
Caelo	Citric acid, anhydrous	16208606	8
Caelo	Citric acid, anhydrous	16038713	1
Caelo	Citric acid, anhydrous	16208605	3
Caelo	Citric acid, anhydrous	16208405	1
Ebert-Jacobi	Citric acid, anhydrous	16208607	1
Caelo	Citric acid, anhydrous	16208610	3
Caelo	Citric acid, anhydrous	16208608	1
Caelo	Citric acid, anhydrous	16208612	1
Sanacorp	Citric acid, anhydrous	16208614	1
Caelo	Citric acid, anhydrous	16215408	1

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Supplier	Substance	Batch	Spectra
Caelo	Citric acid, anhydrous	16215403	1
Caelo	Citric acid, anhydrous	17162701	3
Caelo	Citric acid, anhydrous	17162601	1
Caelo	Citric acid, anhydrous	17162702	1
Caelo	Citric acid, anhydrous	21531	1
Fagron	Citric acid, anhydrous	330449	1
fishar	Citric acid, anhydrous	6494061	1
Otto Fischar	Citric acid, anhydrous	6494061	1
Euro OTC	Citric acid, anhydrous	L1604061-02	1
Euro OTC	Citric acid, anhydrous	L1609021-01	1
Fagron	Citric acid, anhydrous	UJ501	1
Caelo	Citric acid, anhydrous	xxxx	1
Caelo	Citric acid, anhydrous	xxxxxx	1
Caelo	Citric acid, anhydrous	1081203	1
Caelo	Citric acid, anhydrous	2071303	1
Fagron	Citric acid, anhydrous	214U-01024	1
Caelo	Citric acid, anhydrous	713I-01024	1
Caelo	Citric acid, anhydrous	9158408	1
Caelo	Citric acid, anhydrous	9199105	1
Anzag	Citric acid, anhydrous	10049713	1
Anzag	Citric acid, anhydrous	10049712	1
Caelo	Citric acid, anhydrous	10049716	1
Caelo	Citric acid, anhydrous	10109202	1
Euro OTC	Citric acid, anhydrous	1011047-01	1
Euro OTC	Citric acid, anhydrous	1011047-03	2
Caelo	Citric acid, anhydrous	1011047-03	1
Noweda	Citric acid, anhydrous	1011047-02	1
Caelo	Citric acid, anhydrous	10182417	1
Fagron	Citric acid, anhydrous	10G21-N05	1
Caelo	Citric acid, anhydrous	10182419	1
Caelo	Citric acid, anhydrous	11041410	1
Caelo	Citric acid, anhydrous	11011310	1
Caelo	Citric acid, anhydrous	11025514	1
Caelo	Citric acid, anhydrous	11066806	1
Caelo	Citric acid, anhydrous	11066805	1
Caelo	Citric acid, anhydrous	11126901	1
Anzag am 04.06.2012	Citric acid, anhydrous	11126901	1
Caelo	Citric acid, anhydrous	11126904	1
Caelo	Citric acid, anhydrous	11126909	1
Caelo	Citric acid, anhydrous	11126911	1
Caelo	Citric acid, anhydrous	11159801	2
Caelo	Citric acid, anhydrous	11159816	1
Caelo	Citric acid, anhydrous	11159817	4
Caelo	Citric acid, anhydrous	11159821	3
Caelo	Citric acid, anhydrous	11159824	1
Caelo	Citric acid, anhydrous	11189817	1
Caelo	Citric acid, anhydrous	1126909	1
Fagron	Citric acid, anhydrous	1137408	2
Caelo	Citric acid, anhydrous	113802013	1
Caelo	Citric acid, anhydrous	11380208	1
Caelo	Citric acid, anhydrous	11380206	1
Caelo	Citric acid, anhydrous	11380212	1
Post-Apotheke	Citric acid, anhydrous	11380207	1
Caelo	Citric acid, anhydrous	11380215	5
Caelo	Citric acid, anhydrous	11380213	1
Noweda	Citric acid, anhydrous	1141364	1
Fagron	Citric acid, anhydrous	1141664	1
Fagron	Citric acid, anhydrous	1151608	3
Gehe 04.04.2013	Citric acid, anhydrous	1155609	1
Jungbunzlauer Ladenburg...	Citric acid, anhydrous	1156158	1

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Supplier	Substance	Batch	Spectra
Jungbunzlauer Ladenburg...	Citric acid, anhydrous	1155609	1
Caelo	Citric acid, anhydrous	1172673	1
Fagron	Citric acid, anhydrous	1181765	2
Fagron	Citric acid, anhydrous	11B11-N16	1
Fagron	Citric acid, anhydrous	11C24-N02	3
Gehe	Citric acid, anhydrous	11C24-N03	2
GEHE	Citric acid, anhydrous	11B11-N16	1
Gehe	Citric acid, anhydrous	11C24-N02	1
Caelo	Citric acid, anhydrous	11C24-N02	1
Fagron	Citric acid, anhydrous	11C24-N03	6
Anzag 15.09.2012	Citric acid, anhydrous	11C24-N03	2
Noweda	Citric acid, anhydrous	11F29-N03	1
Caelo	Citric acid, anhydrous	11C24-N03	1
Fagron	Citric acid, anhydrous	11C24-N02	1
Fagron	Citric acid, anhydrous	11F29-N03	1
Phönix Gotha	Citric acid, anhydrous	11K07-N01	1
Caelo	Citric acid, anhydrous	11K07-N01	1
Fagron	Citric acid, anhydrous	11K07N01	1
Gehe	Citric acid, anhydrous	11K07-N01	2
Anzag, 19.12.2012	Citric acid, anhydrous	11K07-N01	1
Caelo	Citric acid, anhydrous	12043101	1
Caelo	Citric acid, anhydrous	11K11-N02	1
Fagron	Citric acid, anhydrous	11K11-N02	2
Noweda	Citric acid, anhydrous	12043105	1
ANZAG am 12.06.2012	Citric acid, anhydrous	12043104	1
Caelo	Citric acid, anhydrous	12043110	3
Caelo	Citric acid, anhydrous	12043109	1
Noweda	Citric acid, anhydrous	12043110	2
Gehe	Citric acid, anhydrous	12043111	1
Caelo	Citric acid, anhydrous	12043112	6
Kehr	Citric acid, anhydrous	12043112	1
Caelo	Citric acid, anhydrous	12043113	8
Caelo	Citric acid, anhydrous	12043114	2
Caelo	Citric acid, anhydrous	12043118	5
Caelo	Citric acid, anhydrous	12043120	5
Caelo	Citric acid, anhydrous	12043123	9
Caelo	Citric acid, anhydrous	12043124	3
Alliance Healthcare	Citric acid, anhydrous	12043123	1
Caelo	Citric acid, anhydrous	12156801	2
Caelo	Citric acid, anhydrous	12156803	8
Caelo	Citric acid, anhydrous	12156804	4
Sanacorp	Citric acid, anhydrous	12156811	1
Caelo	Citric acid, anhydrous	12156812	6
Caelo	Citric acid, anhydrous	12156822	8
Caesar & Loretz/ Noweda	Citric acid, anhydrous	12156812	1
Caelo	Citric acid, anhydrous	12156823	5
Sanacorp	Citric acid, anhydrous	12156823	1
Sanacorp	Citric acid, anhydrous	12156832	1
Caelo	Citric acid, anhydrous	12156830	1
Sanacorp	Citric acid, anhydrous	1216832	1
Caelo	Citric acid, anhydrous	121568704	1
Caelo	Citric acid, anhydrous	12175709	1
Fagron	Citric acid, anhydrous	12801-N01	1
Fagron	Citric acid, anhydrous	12A20-N03	1
phönix 13.02.2013	Citric acid, anhydrous	12B01-N01	2
Krömpke	Citric acid, anhydrous	12B01-N01	2
Fargon	Citric acid, anhydrous	12B01-N01	1
Großhandel	Citric acid, anhydrous	12B01-N01	2
Fagron	Citric acid, anhydrous	12B01N01	1
Fargon	Citric acid, anhydrous	12B01-NN01	1

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Supplier	Substance	Batch	Spectra
Gehe	Citric acid, anhydrous		1
Phönix Gotha	Citric acid, anhydrous	12B01-N011973/6000	1
Phönix Gotha	Citric acid, anhydrous	12B01-N012028/6000	1
Fagron	Citric acid, anhydrous	12BO1-NO1	1
Caelo	Citric acid, anhydrous	12F06-M06	1
Fagron	Citric acid, anhydrous	12B01-NO1	1
Phoenix	Citric acid, anhydrous	12b01-N01	1
Fagron	Citric acid, anhydrous	12B01-No1	1
Fagron	Citric acid, anhydrous	12F06-M06	3
Caelo	Citric acid, anhydrous	13050601	9
Noweda	Citric acid, anhydrous	13050601	1
Caesar & Loretz GmbH Hi...	Citric acid, anhydrous	13050601	2
Caelo	Citric acid, anhydrous	13050604	15
A.H. 08.06.13 ek: 6,92EUR	Citric acid, anhydrous	13050604	1
Caelo	Citric acid, anhydrous	13050606	6
Sanacorp	Citric acid, anhydrous	13050604	2
Caelo	Citric acid, anhydrous	13050607	10
AHD	Citric acid, anhydrous	13050607	1
Phönix Gotha	Citric acid, anhydrous	13050609	1
Caesar/Lorenz	Citric acid, anhydrous	13050610	1
10; 26.06.2013	Citric acid, anhydrous	13050611	1
Caelo	Citric acid, anhydrous	13050613	16
Caelo	Citric acid, anhydrous	13050614	8
Phoenix	Citric acid, anhydrous	13050614	1
20; 10.07.2013	Citric acid, anhydrous	13050617	1
Caelo	Citric acid, anhydrous	13050618	3
Noweda	Citric acid, anhydrous	13050621	1
Caelo	Citric acid, anhydrous	13050621	2
Caelo	Citric acid, anhydrous	13050623	2
Caelo	Citric acid, anhydrous	1305601	1
Caelo	Citric acid, anhydrous	13050624	1
Caelo	Citric acid, anhydrous	13157404	1
Caelo	Citric acid, anhydrous	13175402	3
Gehe	Citric acid, anhydrous	13175403	1
Gehe	Citric acid, anhydrous	13175404	1
Caelo	Citric acid, anhydrous	13175414	2
Phoenix	Citric acid, anhydrous	13243202	1
Caesar&loretz,Phoenix	Citric acid, anhydrous	13243201	1
Caelo	Citric acid, anhydrous	1380208	1
Hustadt Apotheke	Citric acid, anhydrous	1350601	1
Caelo	Citric acid, anhydrous	13804-N01	1
Fagron	Citric acid, anhydrous	13804-N02	1
Fagron	Citric acid, anhydrous	13A-04-N04	2
Phönix	Citric acid, anhydrous	13A04-N04	1
Fagron	Citric acid, anhydrous	13A04-NO4	1
Fagron	Citric acid, anhydrous	13Ao4-No4	1
Fagron	Citric acid, anhydrous	13B04-N01	1
Caelo	Citric acid, anhydrous	13G24-N13	2
Fagron	Citric acid, anhydrous	13G24-N13	7
Euro OTC	Citric acid, anhydrous	13K18-B34	1
Phoenix	Citric acid, anhydrous	13K18-B34-288372	1
Sanacorp	Citric acid, anhydrous	13K18-B34-291072	1
	Citric acid, anhydrous	13K18-B34-291523	1
Caelo	Citric acid, anhydrous	15214301	1
Caelo	Citric acid, anhydrous	17071301	1
Fagron	Citric acid, anhydrous	1601311024	1
Caelo	Citric acid, anhydrous	19041304	1
Caelo	Citric acid, anhydrous	19041305	1
Fagron	Citric acid, anhydrous	1913A-01024	1
Caelo	Citric acid, anhydrous	20060912-3	1

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Supplier	Substance	Batch	Spectra
Fagron	Citric acid, anhydrous	20071203	1
Caelo	Citric acid, anhydrous	20151112-1	1
Fagron	Citric acid, anhydrous	26082013B	1
Otto Fischer GmbH	Citric acid, anhydrous	6492061	1
Fargon/Sanacorp	Citric acid, anhydrous		1
ALLIANCE HEALTHCARE/FIS…	Citric acid, anhydrous	6492061	1
Fagron	Citric acid, anhydrous	4810E-01024	1
GEHE	Citric acid, anhydrous	700309-0003	1
Caelo	Citric acid, anhydrous	CH12043112	1
Caelo	Citric acid, anhydrous	A-040513-1	1
Fagron	Citric acid, anhydrous	700309-0006	1
Eu Rho	Citric acid, anhydrous	L1202001-01	1
Fagron	Citric acid, anhydrous	700309-001	1
Caelo	Citric acid, anhydrous	L130404202	1
Euro OTC	Citric acid, anhydrous	L130404201	2
Euro OTC	Citric acid, anhydrous		1
Euro OTC	Citric acid, anhydrous	L1304042-02	1
Noweda	Citric acid, anhydrous	L1202001-02	1
Fagron	Citric acid, anhydrous	probe	1
Phoenix	Citric acid, anhydrous	1172673	1
Fagron	Citric acid, anhydrous	11K11-N020444/1975	1
Fagron	Citric acid, anhydrous	12175711	1
Caelo	Citric acid, anhydrous	133243218	1
Alliance Health 03.06.2…	Citric acid, anhydrous	13K18-B34	1
Fagron	Citric acid, anhydrous	13K18-B34291522	1
Euro OTC	Citric acid, anhydrous	1406014-02	1
Fagron	Citric acid, anhydrous	14E-06-B07-293890	1
Fagron	Citric acid, anhydrous	14g04-b09293877	1
Fragon/Phoenix	Citric acid, anhydrous	14G04-B09-293976	1
Lamotte	Citric acid, anhydrous	15063213	1
Caelo	Citric acid, anhydrous	15091401	1
Caelo	Citric acid, anhydrous	1512402	1
Fagron	Citric acid, anhydrous	15G16b01	1
Caelo	Citric acid, anhydrous	16038710	2
Caelo	Citric acid, anhydrous	16208613	1
Caelo	Citric acid, anhydrous	17329502	1
Caelo	Citric acid, anhydrous	24021502	1
Sanacorp	Citric acid, anhydrous	40/AKD2	1
Caelo	Citric acid, anhydrous	11380205	1
Caelo	Citric acid, anhydrous	261BE-01024	1
Fagron	Citric acid, anhydrous	10G21-N05	2
Caelo	Citric acid, anhydrous	11178304	1
Phönix	Citric acid, anhydrous	1155609	1
GEHE	Citric acid, anhydrous	11C24-N03	1
Caelo	Citric acid, anhydrous	12043119	1
Caelo	Citric acid, anhydrous	12156818	1
Caelo	Citric acid, anhydrous	12156827	1
Phönix Gotha	Citric acid, anhydrous	12B01-N012125/6000	1
Caelo	Citric acid, anhydrous	12B01No1	1
Euro OTC	Citric acid, anhydrous	13050604	1
Phönix Gotha	Citric acid, anhydrous	13050618	1
Euro OTC	Citric acid, anhydrous	13175410	1
fargon	Citric acid, anhydrous	13A04-N04	1
Fagron	Citric acid, anhydrous	13F12N01	1
Fagron	Citric acid, anhydrous	13A04-N040019/4900	1
Fagron	Citric acid, anhydrous	2203140l	1
Caelo	Citric acid, anhydrous	26111301	1
Caelo	Citric acid, anhydrous	27091303	1
Caelo	Citric acid, anhydrous	27091304	1
Fagron	Citric acid, anhydrous	28021404	1

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Supplier	Substance	Batch	Spectra
Caelo	Citric acid, anhydrous	28021405	1
Audor Pharma	Citric acid, anhydrous	PA201	1

- 75 694 spectra from 463 *Apo-Ident* customers from a total of 25 159 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Citric acid, anhydrous* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Citric acid, anhydrous* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	280	0	72 153
Type B	0	449	1	161 623
Type C	0	1452	13	75 694

The substance/substance group *Citric acid, anhydrous* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.8571 %)
Type B	100.0000 % (> 99.9928 %)	99.7778 % (> 99.1111 %)
Type C	100.0000 % (> 99.8849 %)	99.1126 % (> 98.9078 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20682	22463	13.61	36.74
20683	22463	4.53	39.45

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Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20706	22463	13.98	36.99
20913	22463	5.96	36.21
21455	22463	13.28	38.72
21487	22463	5.00	41.39
22463	22463	0.00	40.68

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Citrulline**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	21095-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Citrulline; Citrullinum; L-citrulline

Special notes

When selecting the *Citrulline* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Citrulline*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Citrulline	1310015-01	21095	40	20131120
Euro OTC	Citrulline	1403021-01	21565	40	1411031
Euro OTC	Citrulline	1506014	21828	40	20150624*
Euro OTC	Citrulline	1604038	22560	40	20160523*
Euro OTC	Citrulline	1703036	23175	40	20170418*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 200 spectra of 5 reference samples from the substance/substance group *Citrulline*. These samples are listed above in the section *calibration samples*. The reference samples originate from 5 different batches.

- 72 233 spectra from a total of 1577 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 199 spectra from 6 reference samples of the substance/substance group *Citrulline*.

- These include spectra of independent samples from 4 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Citrulline	1403021-01	21565†	19
Euro OTC	Citrulline	1506014	21828†	20
Euro OTC	Citrulline	1609013	22866	40
Euro OTC	Citrulline	1707003	23538	40
Fagron	Citrulline	16D11-B02-326797	23567	40
Euro OTC	Citrulline	1710039	23913	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 874 spectra from a total of 3493 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 4 spectra from 3 *Apo-Ident* customers from 4 batches from the substance/substance group *Citrulline*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Euro OTC	Citrulline	16040038-01	1
Gall-Pharma GmbH/Noweda	Citrulline		1
Euro OTC	Citrulline	L1506014-01	1
Gall-Pharma GmbH	Citrulline		1

- 77 155 spectra from 463 *Apo-Ident* customers from a total of 25 543 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Citrulline* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Citrulline* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	200	0	72 233
Type B	0	199	0	161 874
Type C	0	4	0	77 155

The substance/substance group *Citrulline* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 96.9849 %)
Type C	100.0000 % (> 99.8853 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several

new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21095	21565	9.77	52.40
21565	21565	0.00	50.69
21828	21828	0.00	50.14
22560	22560	0.00	46.79
23175	23175	0.00	48.89

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Clindamycin hydrochloride**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20214-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Clindamycin hydrochloride; Clindamycini hydrochloridum; Clindamycinum hydrochloricum

Special notes

When selecting the *Clindamycin hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Clindamycin hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Clindamycin hydr…	1111058-01	20757	80	20120516
Fagron	Clindamycin hydr…	13G24-N09	21224	40	1412075
Euro OTC	Clindamycin hydr…	1511004	21996	40	20151123*
Euro OTC	Clindamycin hydr…	1510038	22224	40	20151120*
Caelo	Clindamycin hydr…	15392809	22958	40	20151204

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 240 spectra of 5 reference samples from the substance/substance group *Clindamycin hydrochloride*. These samples are listed above in the section *calibration samples*. The reference samples originate from 5 different batches.

- 72 193 spectra from a total of 1577 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 312 spectra from 9 reference samples of the substance/substance group *Clindamycin hydrochloride*.

- These include spectra of independent samples from 7 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Clindamycin hydrochloride	2908019-01	20214	40
Euro OTC	Clindamycin hydrochloride	1401041-01	21239	40
Euro OTC	Clindamycin hydrochloride	1511004	21996†	20
Euro OTC	Clindamycin hydrochloride	1510038	22224†	20
Caelo	Clindamycin hydrochloride	15392817	23245	40
Fagron	Clindamycin hydrochloride	16D05-B08-332106	23264	40
Caelo	Clindamycin hydrochloride	153928	23365	32
Caelo	Clindamycin hydrochloride	172093	23681	40
Euro OTC	Clindamycin hydrochloride	1710013	23769	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 761 spectra from a total of 3490 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 199 spectra from 81 *Apo-Ident* customers from 92 batches from the substance/substance group *Clindamycin hydrochloride*.

- These include spectra of independent samples from 90 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Euro OTC	Clindamycin hydrochloride	813M-03534	1
Euro OTC	Clindamycin hydrochloride	1111058-01	7
Euro OTC	Clindamycin hydrochloride	1111058-03	3
Fagron	Clindamycin hydrochloride	111105803	1
Euro OTC	Clindamycin hydrochloride	4988149	1
Phönix	Clindamycin hydrochloride	12H30-N04	1
Euro OTC	Clindamycin hydrochloride	130709X8	2
Fagron	Clindamycin hydrochloride	13A22-N01	7
Fagron	Clindamycin hydrochloride	13G24N09	1
Fagron	Clindamycin hydrochloride	13G24-N09	11
Caelo	Clindamycin hydrochloride	13G24-N09	1
Fagron	Clindamycin hydrochloride	13J03-B02	1
Fagron	Clindamycin hydrochloride	13J03-B02-288653	1
Fagron	Clindamycin hydrochloride	13J03-B02288654	1
Fagron	Clindamycin hydrochloride	13j03-B02-288653	1
Fagron	Clindamycin hydrochloride	13J03B02288654	1
Fagron	Clindamycin hydrochloride	13J03-B02-288654	4
Fagron	Clindamycin hydrochloride	13J03-B02-288655	3
Euro OTC	Clindamycin hydrochloride	1401041-01	11
Caelo	Clindamycin hydrochloride	1401041-01	2
EuRho	Clindamycin hydrochloride	1401041-01	1
Euro OTC	Clindamycin hydrochloride	140104101	1
Euro OTC	Clindamycin hydrochloride	1401041-02	6
Euro OTC	Clindamycin hydrochloride	140104102	3
EuRho	Clindamycin hydrochloride	1401041-02	1
Euro OTC	Clindamycin hydrochloride	1401401-01	1
Fagron	Clindamycin hydrochloride	14K04-B05-304995	1
Fagron	Clindamycin hydrochloride	14D23-B03	1
Fagron	Clindamycin hydrochloride	14K04-B05-304996	1
Euro OTC	Clindamycin hydrochloride	150901B	1
Fagron	Clindamycin hydrochloride	14K04-B05-309851	1
Fagron	Clindamycin hydrochloride	14K04-B05-313090	1
Caelo	Clindamycin hydrochloride	14K04B05309851	1
Euro OTC	Clindamycin hydrochloride	1510038-01	14
Euro OTC	Clindamycin hydrochloride	1510030-01	1
Euro/Gehe16.03.16	Clindamycin hydrochloride	1510038-01	1
Caelo	Clindamycin hydrochloride	151003801	1
Eurho/Noweda	Clindamycin hydrochloride	1510038-01	1

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Supplier	Substance	Batch	Spectra
Euro OTC	Clindamycin hydrochloride	1510038-02	2
Euro OTC	Clindamycin hydrochloride	1511004-01	11
Caelo	Clindamycin hydrochloride	1511004-01	1
Euro OTC	Clindamycin hydrochloride	1511004-02	1
Caelo	Clindamycin hydrochloride	15392804	1
Sanacorp	Clindamycin hydrochloride	1511004-03	1
Phönix	Clindamycin hydrochloride	15392803	1
Caelo	Clindamycin hydrochloride	15392805	1
Caelo	Clindamycin hydrochloride	15E06-B12-310472	1
Caelo	Clindamycin hydrochloride	15392815	1
phönix	Clindamycin hydrochloride	15392820	1
Fagron	Clindamycin hydrochloride	15E06-B12-311886	3
Fagron	Clindamycin hydrochloride	15E06-B12-313089	2
Fagron	Clindamycin hydrochloride	15E06-B12-314064	1
Fagron	Clindamycin hydrochloride	15E06-B12-314066	2
Fagron	Clindamycin hydrochloride	15L22-B03-318786	1
Fagron	Clindamycin hydrochloride	15L22-B03-318787	1
Fagron	Clindamycin hydrochloride	1600324C	1
Fagron	Clindamycin hydrochloride	16D05-B08	2
Fagron	Clindamycin hydrochloride	16D05-B08-320327	2
Caelo	Clindamycin hydrochloride	15L22-B03-318788	1
Fagron	Clindamycin hydrochloride	16D05-B08-321002	1
Fagron	Clindamycin hydrochloride	16D05-B08-321572	1
Fagron	Clindamycin hydrochloride	16D05-B08-323321	1
Fagron	Clindamycin hydrochloride	16D05-B08-325087	2
Cealo/AHD	Clindamycin hydrochloride	16D05-B08-325088	1
Fagron	Clindamycin hydrochloride	16D05-B08-325088	1
Phoenix	Clindamycin hydrochloride	16D05-B08-327127	1
Fagron	Clindamycin hydrochloride	16D05-B08-327127	1
Fagron	Clindamycin hydrochloride	16D05-B08-328260	1
Fagron	Clindamycin hydrochloride	16d05-b08-325089	1
Fagron	Clindamycin hydrochloride	16d05-b08-332107	1
Euro OTC	Clindamycin hydrochloride	16D05-B08-328259	1
Caelo	Clindamycin hydrochloride	16H03-B02	1
Fagron	Clindamycin hydrochloride	16H03-B02-334345	1
Euro OTC	Clindamycin hydrochloride	1710013-01	3
Euro OTC	Clindamycin hydrochloride	25071401	1
Fagron	Clindamycin hydrochloride	2714Q-03534	1
Euro OTC	Clindamycin hydrochloride	700168	1
Euro OTC	Clindamycin hydrochloride	2908019V-03	4
Fagron	Clindamycin hydrochloride	P003WS13091401	1
Euro OTC	Clindamycin hydrochloride	T03-05/1401041-01	1
Caelo	Clindamycin hydrochloride		1
Großhandel	Clindamycin hydrochloride	1111058-01	1
Cealo	Clindamycin hydrochloride	1111058-01	1
Europharm/Otto	Clindamycin hydrochloride	1111058-01	1
Euro OTC	Clindamycin hydrochloride	1111058-02	3
Caelo	Clindamycin hydrochloride	1111058-03	1
Fargon	Clindamycin hydrochloride	11L20-No5	1
Fagron	Clindamycin hydrochloride	14D23-B03-295477	2
Phoenix 19.08.2010	Clindamycin hydrochloride	2908019-01phoen	1
Noweda	Clindamycin hydrochloride	2908019V-03	1
Euro OTC	Clindamycin hydrochloride	111158-01	1
Gehe	Clindamycin hydrochloride	11E12-N02	1
Gehe	Clindamycin hydrochloride	11K04-N12	1
Fagron	Clindamycin hydrochloride	12C19-N06	1
Caelo	Clindamycin hydrochloride	11K04-N12	1
Fagron	Clindamycin hydrochloride	12F19-N07	3
Fagron	Clindamycin hydrochloride	12H30-N04	1
AHD	Clindamycin hydrochloride	130402X5	1

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Supplier	Substance	Batch	Spectra
Gehe	Clindamycin hydrochloride	13a22-n01	1
Gehe	Clindamycin hydrochloride	13A22-N01	1
Fagron	Clindamycin hydrochloride	13C15-N06	1
Fragon	Clindamycin hydrochloride	13G24-N09	1
Fagron	Clindamycin hydrochloride	14K04-B05-304997	1
Caelo	Clindamycin hydrochloride	15L22-B03-316671	1
Fagron	Clindamycin hydrochloride	15E06B12-310472	1
Fagron	Clindamycin hydrochloride	7BS64T1J0023	1
Gehe	Clindamycin hydrochloride	700168-0002	1
Fagron	Clindamycin hydrochloride	P003-WS10100301	1
Caelo	Clindamycin hydrochloride	P-003-WS10100301	1
Fagron	Clindamycin hydrochloride	12C19N06	1

- 76 960 spectra from 463 *Apo-Ident* customers from a total of 25 457 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Clindamycin hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Clindamycin hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	240	0	72 193
Type B	0	298	14	161 761
Type C	0	183	16	76 960

The substance/substance group *Clindamycin hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.5000 %)
Type B	100.0000 % (> 99.9928 %)	95.5128 % (> 94.5513 %)
Type C	100.0000 % (> 99.8850 %)	91.9598 % (> 90.4523 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20757	21996	3.11	24.52
21224	21224	0.00	21.10
21996	21996	0.00	22.48
22224	22224	0.00	23.05
22958	21224	2.70	22.40

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Clindamycin-2-dihydrogen phosphate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	21063-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Clindamycin-2-dihydrogen phosphate; Clindamycini phosphas; Clindamycinum phosphoricum

Special notes

When selecting the *Clindamycin-2-dihydrogen phosphate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Clindamycin-2-dihydrogen phosphate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Clindamycin-2-di…	13166605	21063	40	1403485
Caelo	Clindamycin-2-di…	13166605	21116	40	20130624
Caelo	Clindamycin-2-di…	15435801	22312	40	AR-16-FG-009129-01
Caelo	Clindamycin-2-di…	163265	23055	40	20161214*
Caelo	Clindamycin-2-di…	16326504	23586	40	AR-17-FG-022557-01

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 200 spectra of 5 reference samples from the substance/substance group *Clindamycin-2-dihydrogen phosphate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 4 different batches.

- 72 233 spectra from a total of 1578 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 280 spectra from 6 reference samples of the substance/substance group *Clindamycin-2-dihydrogen phosphate*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Clindamycin-2-dihydrogen pho…	14257305	21798	60
Caelo	Clindamycin-2-dihydrogen pho…	15435801	22312†	20
Caelo	Clindamycin-2-dihydrogen pho…	172964	24047	40
Caelo	Clindamycin-2-dihydrogen pho…	14257305	21798SI	60
Caelo	Clindamycin-2-dihydrogen pho…	15435801	22312SI	60
Caelo	Clindamycin-2-dihydrogen pho…	163265	23055SI	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 793 spectra from a total of 3495 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 1 spectra from 1 *Apo-Ident* customers from 1 batches from the substance/substance group *Clindamycin-2-dihydrogen phosphate*.

- These include spectra of independent samples from 1 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Clindamycin-2-dihydrogen pho…	14257305	1

- 77 158 spectra from 463 *Apo-Ident* customers from a total of 25 546 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Clindamycin-2-dihydrogen phosphate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Clindamycin-2-dihydrogen phosphate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	200	0	72 233
Type B	0	177	103	161 793
Type C	0	1	0	77 158

The substance/substance group *Clindamycin-2-dihydrogen phosphate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9928 %)	63.2143 % (> 62.1429 %)
Type C	100.0000 % (> 99.8862 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to

exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21063	21063	0.00	22.64
21116	21063	5.56	22.82
22312	22312	0.00	28.82
23055	23055	0.00	22.20
23586	23586	0.00	26.77

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Clioquinol**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20095-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Clioquinol; Clioquinolum; Jodochloroxychinolinum

Special notes

When selecting the *Clioquinol* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Clioquinol*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Clioquinol	11304120	20895	40	20111208
Fagron	Clioquinol	13I26-N15	21236	40	20131028
Euro OTC	Clioquinol	1309009-02	21246	40	AR-15-FG-009542-01
Fagron	Clioquinol	14I11-B03-300049	21913	40	20140926
Euro OTC	Clioquinol	1509038	21944	40	20151009*
Fagron	Clioquinol	14I11-B03-300049	21972	40	20140926
Caelo	Clioquinol	163072	23047	40	20161202*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 280 spectra of 7 reference samples from the substance/substance group *Clioquinol*. These samples are listed above in the section *calibration samples*. The reference samples originate from 6 different batches.

- 72 153 spectra from a total of 1576 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 210 spectra from 7 reference samples of the substance/substance group *Clioquinol*.

- These include spectra of independent samples from 4 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Clioquinol	13114413	21308	40
Fagron	Clioquinol	14I11-B03-300049	21913†	20
Euro OTC	Clioquinol	1509038	21944†	20
Fagron	Clioquinol	14I11-B03-300049	21972†	20
Caelo	Clioquinol	16307206	22960	40
Euro OTC	Clioquinol	1612020	22985	40
Caelo	Clioquinol	172046	23633	30

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 863 spectra from a total of 3493 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 626 spectra from 256 *Apo-Ident* customers from 167 batches from the substance/substance group *Clioquinol*.

- These include spectra of independent samples from 159 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Clioquinol	3041409	1
Fagron	Clioquinol	7D20-N03	1
Caelo	Clioquinol	5031302	1
Noweda	Clioquinol	10057206	1
Caelo	Clioquinol	10341601	2
Fagron	Clioquinol	1005090024	1
Fagron	Clioquinol	10341601	2
Caelo	Clioquinol	10341605	4
Caelo	Clioquinol	10341608	2
Euro OTC	Clioquinol	1102022-01	2
Euro OTC	Clioquinol	1102022-02	3
Gehe	Clioquinol	1102022-01	1
Phönix	Clioquinol	1102022-02	4
Caelo	Clioquinol	11304102	9
Caelo	Clioquinol	1130312	1
Caelo	Clioquinol	11304103	2
Caelo	Clioquinol	11304105	5
Erika Apotheke	Clioquinol	11304102	1
Caelo	Clioquinol	11304107	6
Noweda	Clioquinol	11304107	1
Caelo	Clioquinol	11304109	3
Caelo	Clioquinol	11304111	3
Sanacorp	Clioquinol	11304111	1
Noweda	Clioquinol	11304111	1
Caelo	Clioquinol	11304112	7
Noweda	Clioquinol	11304112	1
Fagron	Clioquinol	11304112	1
Caelo	Clioquinol	11304113	4
Caelo	Clioquinol	11304116	4
Caelo	Clioquinol	11304117	12
Caelo	Clioquinol	11304119	4
Phoenix	Clioquinol	11304119	1
Caelo	Clioquinol	11304120	13
Klenk	Clioquinol	11304120	2
Alliance Health 21.10.2...	Clioquinol	11304120	1
Fagron	Clioquinol	11304120	1
Caelo	Clioquinol	11304124	13
Phönix Gotha	Clioquinol	11304124	1
Fagron	Clioquinol	11G20-N09	3
Sanacorp	Clioquinol	11304124	1
Caelo	Clioquinol	11B11-N19	1

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Supplier	Substance	Batch	Spectra
Fagron	Clioquinol	11K21N18	1
Großhandel	Clioquinol	11G20-N09	1
Fagron	Clioquinol	11K21-N18	4
Noweda	Clioquinol	120103401	1
Caelo	Clioquinol	1201034-01	1
Euro OTC	Clioquinol	1201034-01	8
Euro OTC	Clioquinol	1201034-02	9
Anzag am 27.12.12	Clioquinol	1201034-01	1
Noweda	Clioquinol	1201034-02	2
Phönix	Clioquinol	1201034-02	1
Gehe 09.04.2013	Clioquinol	1201034-02	2
Caelo	Clioquinol	1201034-02	2
EuRho	Clioquinol	1201034-02	1
Fagron	Clioquinol	1205110014	1
Euro OTC	Clioquinol	121034-02	1
Euro OTC	Clioquinol	1213A-02562	1
Caelo	Clioquinol	1214I02562	1
Fagron	Clioquinol	12F20-N05	5
Fagron	Clioquinol	12D02-N11	1
Fagron	Clioquinol	12L04-N08	7
Caelo	Clioquinol	12F20-N05	1
Anzag	Clioquinol	12L04-N08	1
Großhandel	Clioquinol	12L04-N08	1
Caelo	Clioquinol	12L04-N08	2
Fargron	Clioquinol	12L04-N08	1
Fagron	Clioquinol	13/26-N15	3
Euro OTC	Clioquinol	13010104-03	1
Euro OTC	Clioquinol	1301014	1
Euro OTC	Clioquinol	1301014-01	3
Euro OTC	Clioquinol	1301014-02	5
Axyntis Group	Clioquinol	1301014-02	1
Axyntis Group	Clioquinol	1301014-03	1
Euro OTC	Clioquinol	1301014-0Z	1
Euro OTC	Clioquinol	1303009-02	1
Fagron	Clioquinol	1305120028	1
Euro OTC	Clioquinol	1309009-01	7
Cealo/Sanacorp	Clioquinol	1309009-01	1
Noweda	Clioquinol	1309009-01	1
Euro OTC	Clioquinol	1309009-02	10
Fagron	Clioquinol	1309009-01	1
EuRho	Clioquinol	1309009-02	1
Caelo	Clioquinol	1309009-02	1
Euro OTC	Clioquinol	130900902	1
Phönix	Clioquinol	1309009-02	1
Caelo	Clioquinol	13114404	3
Euro OTC	Clioquinol	1309009-03	1
Caelo	Clioquinol	13114406	1
Phoenix	Clioquinol	13114408	2
Caelo	Clioquinol	13114410	3
Caelo	Clioquinol	13114408	4
Caelo	Clioquinol	13114413	11
Synthexim/Phoenix	Clioquinol	13114415	1
Caelo	Clioquinol	13114415	3
Caelo	Clioquinol	13114417	7
Phoenix	Clioquinol	13114417	1
Fagron	Clioquinol	13114417	1
Phönix	Clioquinol	13114417	1
Caelo	Clioquinol	13114418	7
GEHE 04.08.2014	Clioquinol	13114418	1
anzag	Clioquinol	13114418	1

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Supplier	Substance	Batch	Spectra
Caelo	Clioquinol	13114422	9
Caelo	Clioquinol	13114421	1
Noweda 30.09.2014	Clioquinol	13114422	1
Sanacorp	Clioquinol	13114422	1
Caelo	Clioquinol	13114423	13
Caelo	Clioquinol	13114424	13
Fagron	Clioquinol	13114424	1
Caelo	Clioquinol	13114427	4
Fagron	Clioquinol	1326-N15	3
Caelo	Clioquinol	13A29-N07	1
Fagron	Clioquinol	13A29-N07	7
Großhandel	Clioquinol	13D15-N01	2
Fagron	Clioquinol	13D15-N01	9
Fagron	Clioquinol	13DS15-NO1	1
Caelo	Clioquinol	13F12-N20	1
Fagron	Clioquinol	13F12-N20	3
Großhandel	Clioquinol	13F12-N20	1
Fagron	Clioquinol	13F12-N200463480	1
Fagron	Clioquinol	13I26N15	1
Fagron	Clioquinol	13I26-N15	6
Caelo	Clioquinol	13I26-N15	1
Nachprüfung	Clioquinol	13L26-N15	2
Unisan	Clioquinol	14/11-B03	1
Fagron	Clioquinol	14/11-B03-300049	5
Fagron	Clioquinol		1
Caelo	Clioquinol	14/11-B03-309181	1
Fagron	Clioquinol	14/11-B03-309048	1
Fagron	Clioquinol	14/11-B03-309181	1
Caelo	Clioquinol	14/11-BG03-309181	1
Caelo	Clioquinol	14/-B03-309181	1
Caelo	Clioquinol	1405080031	1
Caelo	Clioquinol	1405080036	1
Fagron	Clioquinol	14052014C	1
Euro OTC	Clioquinol	14090131-02	1
Euro OTC	Clioquinol	1409031-01	8
Euro OTC	Clioquinol	140903101	1
Euro OTC	Clioquinol	1409031-02	11
Fiebig	Clioquinol	1409031-02	2
Fagron	Clioquinol	1411-B03-300049	2
Caelo	Clioquinol	14353120	1
Caelo	Clioquinol	14359102	7
Noweda	Clioquinol	14359103	1
Caelo	Clioquinol	14359103	10
Cael Sanacorp 05.02.2016	Clioquinol	14359103	1
Caelo	Clioquinol	14359110	1
Caelo	Clioquinol	14359107	1
Caelo	Clioquinol	14359111	14
caesar&loretz,Phönix	Clioquinol	14359111	1
Caelo	Clioquinol	14359112	16
Caelo	Clioquinol	14359113	1
Caelo	Clioquinol	14359117	4
Caelo	Clioquinol	14359118	5
Bombastus	Clioquinol	14359118	1
Fagron	Clioquinol	14359118	1
Caelo	Clioquinol	14359119	2
Caelo	Clioquinol	14359120	9
Noweda	Clioquinol	14359120	1
Caelo	Clioquinol	14359123	1
wepa/Sanaco	Clioquinol	1439118	1
Fagron	Clioquinol	14C21806293104	1

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Supplier	Substance	Batch	Spectra
Phönix	Clioquinol	14C21-B06	1
Fagron	Clioquinol	14C21-B06	2
Fagron	Clioquinol	14C21-B06-293104	5
Fagron	Clioquinol	14c21B06293104	1
Caelo	Clioquinol	14C21-B06-293104	1
Fagron	Clioquinol	14C21-B06-293132	2
Fagron	Clioquinol	14C21-B06-297159	3
Fagron	Clioquinol	14-C21-B06-293132	1
Phönix	Clioquinol	14C21-B08	1
Fagron	Clioquinol	14C21-B08	1
Fagron	Clioquinol	14I11-B03	2
Fagron	Clioquinol	14I11-B03-300049	3
Fagron	Clioquinol	14I11-B03-3000049	1
Fagron	Clioquinol	14I11-B03-309048	2
Fagron	Clioquinol	14I11-B03-309181	2
Euro OTC	Clioquinol	150903-01	1
Euro OTC	Clioquinol	1509038	1
Euro OTC	Clioquinol	1509038-01	10
Euro OTC	Clioquinol	150903801	1
Caelo	Clioquinol	1509038-01	1
Euro OTC	Clioquinol	1509038-02	20
Apo-ident	Clioquinol	1509038-02	1
Euro OTC	Clioquinol	150903802	1
EURO / Sanacorp	Clioquinol	150903802	1
EurpTec/ Alliance Healt…	Clioquinol	1509038-03	2
Euro OTC	Clioquinol	1509038-03	7
Gehe	Clioquinol	1509038-03	1
Caelo	Clioquinol	1509038-03	1
Caelo	Clioquinol	150903803	1
Fagron	Clioquinol	15L30-321899	1
Euro OTC	Clioquinol	1509038-31	1
Fagron	Clioquinol	15L30-B05-314974	3
Fagron	Clioquinol	15L30-B05-319616	2
Fagron	Clioquinol	15L30-B05-321899	1
Caelo	Clioquinol	16021505	1
Caelo	Clioquinol	1612020-01	1
Euro OTC	Clioquinol	1612020-01	1
Caelo	Clioquinol	16307203	1
Caelo	Clioquinol	16307204	1
Caelo	Clioquinol	16307205	7
Caelo	Clioquinol	16307206	10
Caelo	Clioquinol	16307207	6
Caelo	Clioquinol	16307209	1
Caelo	Clioquinol	16307211	1
Caelo	Clioquinol	16307213	1
Phönix	Clioquinol	16718b04332852	1
Fagron	Clioquinol	16J18-B04	1
Fagron	Clioquinol	16J18-B04-328520	1
Caelo	Clioquinol	16J18-B04-328520	1
Fagron	Clioquinol	16J18-B04-329141	2
phönix	Clioquinol		1
Euro OTC	Clioquinol	2507212562	1
Fagron	Clioquinol	2014Q2562	1
Fagron	Clioquinol	2514U2562	1
Fagron	Clioquinol	28031401	1
Caelo	Clioquinol	2814M-02562	1
Nachprüfung	Clioquinol	3021U-02562	1
Caelo	Clioquinol	3513I-02562	1
Caelo	Clioquinol	3713A2562	1
Fagron	Clioquinol	3916U-02562	1

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Supplier	Substance	Batch	Spectra
Fagron	Clioquinol	3949/V11/15	1
Caelo	Clioquinol	4214Q-02562	1
Caelo	Clioquinol	5089	1
Caelo	Clioquinol	4613E2562	1
Caelo	Clioquinol	5213A2562	1
Caelo	Clioquinol		1
Sanacorp	Clioquinol	8/AKD4	1
Euro OTC	Clioquinol		1
Euro OTC	Clioquinol	PC86	1
Euro OTC	Clioquinol	1305070109	1
Caelo	Clioquinol	130900903	1
Caelo	Clioquinol	10341510	1
Chiesi/Gehe	Clioquinol	13114421	1
Sanacorp	Clioquinol	1201034-01	1
Fagron	Clioquinol	13A29-N07-3398310111	1
Caelo	Clioquinol	130114-02	1
VDL	Clioquinol	131144131	1

- 76 533 spectra from 463 *Apo-Ident* customers from a total of 25 382 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Clioquinol* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Clioquinol* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	280	0	72 153
Type B	0	210	0	161 863
Type C	0	550	76	76 533

The substance/substance group *Clioquinol* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.8571 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 97.1429 %)
Type C	100.0000 % (> 99.8849 %)	87.8594 % (> 87.3802 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20895	23047	8.00	89.95
21236	21246	2.74	75.17
21246	21246	0.00	78.81
21913	21944	3.58	85.97
21944	21944	0.00	78.64
21972	21944	3.99	82.80
23047	23047	0.00	81.71

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Clobetasol propionate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20030-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Clobetasol propionate; Clobetasoli propionas; Clobetasolum propionicum

Special notes

When selecting the *Clobetasol propionate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Clobetasol propionate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Clobetasol propi…	13134705	21092	80	AR-15-FG-005328-01
Caelo	Clobetasol propi…	13269505	21473	40	AR-15-FG-000622-02
Euro OTC	Clobetasol propi…	1211021-04	21611	40	1605044
Caelo	Clobetasol propi…	14338001	21802	40	AR-16-FG-008581-01
Caelo	Clobetasol propi…	14338001	21896	40	1607072

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Clobetasol propi…	1606022	22714	40	20160713*
Caelo	Clobetasol propi…	15439504	22724	40	20160204
Caelo	Clobetasol propi…	14338001	21802SI	39	AR-16-FG-008581-01
Caelo	Clobetasol propi…	14338001	21896SI	30	1607072
Euro OTC	Clobetasol propi…	1606022	22714SI	40	20160713*
Caelo	Clobetasol propi…	15439504	22724SI	37	20160204

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 466 spectra of 11 reference samples from the substance/substance group *Clobetasol propionate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 6 different batches.

- 71 967 spectra from a total of 1576 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 568 spectra from 17 reference samples of the substance/substance group *Clobetasol propionate*.

- These include spectra of independent samples from 6 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Clobetasol propionate	82805079	20030	100
Euro OTC	Clobetasol propionate	zu erfassen	21013	54
zu erfassen	Clobetasol propionate	zu erfassen	21017	20

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*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Clobetasol propionate	13269505	21473†	20
Euro OTC	Clobetasol propionate	1211021-04	21611†	20
Caelo	Clobetasol propionate	14338001	21802†	20
Caelo	Clobetasol propionate	14338001	21896†	19
Caelo	Clobetasol propionate	161067	22470	60
Euro OTC	Clobetasol propionate	1704020	23397	40
Caelo	Clobetasol propionate	170967	23665	30
Euro OTC	Clobetasol propionate	1804002	24075	40
Caelo	Clobetasol propionate	14338001	21802SI†	20
Caelo	Clobetasol propionate	14338001	21896SI†	15
Caelo	Clobetasol propionate	161067	22470SI	48
Euro OTC	Clobetasol propionate	1704020	23397SI	20
Caelo	Clobetasol propionate	170967	23665SI	20
Euro OTC	Clobetasol propionate	1804002	24075SI	22

- 161 505 spectra from a total of 3491 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 1101 spectra from 327 *Apo-Ident* customers from 255 batches from the substance/substance group *Clobetasol propionate*.

- These include spectra of independent samples from 249 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Gehe	Clobetasol propionate	12342310	3
Euro OTC	Clobetasol propionate	1072015D	1
Euro OTC	Clobetasol propionate	4091512	1
Symbiotica Spec./Phönix	Clobetasol propionate	1108044-04	1
Caelo	Clobetasol propionate	11300707	4
Fagron	Clobetasol propionate	11C16-N01	1
Fagron	Clobetasol propionate	11129-N07	1
Euro OTC	Clobetasol propionate	1211021/02	1
Fagron	Clobetasol propionate	1211021	1
Euro OTC	Clobetasol propionate	1211021-02	36
GEHE 21.03.2014	Clobetasol propionate	1211021-02	1
Phönix Gotha	Clobetasol propionate	1211021-02	3
Fagron	Clobetasol propionate	1211021-03	2
Euro OTC	Clobetasol propionate	1211021-03	30
Phoenix 02.04.2014	Clobetasol propionate	1211021-03	3
Apomix/Phönix	Clobetasol propionate	1211021-03	1
Euro OTC	Clobetasol propionate	1211021-04	22

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†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Supplier	Substance	Batch	Spectra
Caelo	Clobetasol propionate	121102104	1
Euro OTC	Clobetasol propionate	121121-04	1
Caelo	Clobetasol propionate	12342309	16
Caelo	Clobetasol propionate	123645	1
Fagron	Clobetasol propionate	12E08-N04	14
Caelo	Clobetasol propionate	12E08-N04	1
Euro OTC	Clobetasol propionate	13042015A	1
Caelo	Clobetasol propionate	13134701	16
Noweda	Clobetasol propionate	13134701	1
Caelo	Clobetasol propionate	13134704	4
Caelo	Clobetasol propionate	13134705	6
Noweda	Clobetasol propionate	13134705	1
Fagron	Clobetasol propionate	1314705	1
Caelo	Clobetasol propionate	13269501	3
Caelo	Clobetasol propionate	13269502	4
Chiesi/ Now	Clobetasol propionate	13269503	3
Noweda/Anzag	Clobetasol propionate	13269504	3
Caelo	Clobetasol propionate	13269504	8
Caelo	Clobetasol propionate	13269505	1
Caelo	Clobetasol propionate	13269507	2
Sanacorp	Clobetasol propionate	13269507	1
Euro OTC	Clobetasol propionate	13269507	2
Caelo	Clobetasol propionate	13269508	16
sanacorp	Clobetasol propionate	13269508	1
Phönix Caesar u. Loretz	Clobetasol propionate	13269508	1
Caelo	Clobetasol propionate	13269509	1
Caelo	Clobetasol propionate	13269510	2
Caelo	Clobetasol propionate	1369504	1
Fagron	Clobetasol propionate	13A02-N04	17
Fagron	Clobetasol propionate	13G23-N01	22
Caelo	Clobetasol propionate	13G23-N01	3
Sanacorp	Clobetasol propionate	13g23n01	1
Fagron	Clobetasol propionate	13K08-B03-287728	1
Fagron	Clobetasol propionate	13K08-B30	3
Bombastus	Clobetasol propionate	13G23-NO1	1
Bombastus	Clobetasol propionate	13G23-NO	1
Caelo	Clobetasol propionate	13K08-B30-287726	1
Fagron	Clobetasol propionate	13K08-B30-287726	2
Fagron	Clobetasol propionate	13K08-B30-287727	2
Raben-Apotheke Mildenau	Clobetasol propionate	13k08-b30-287727	1
Caelo	Clobetasol propionate	13K08-B30-287728	1
Fagron	Clobetasol propionate	13K08-B30-287728	5
Phoenix	Clobetasol propionate	13K08B30287728	1
Fagron	Clobetasol propionate	13k08b30287728	1
Fagron	Clobetasol propionate	13K08-B30-287729	2
Fagron	Clobetasol propionate	13K08-B30-287730	3
Caelo	Clobetasol propionate	13k08b30287730	1
Euro OTC	Clobetasol propionate	1408018-01	15
Euro OTC	Clobetasol propionate	1408018-03	19
Fagron	Clobetasol propionate	13K08B30287730	1
Euro OTC	Clobetasol propionate	1408015-01	1
Euro OTC	Clobetasol propionate	1406018-01	1
EuRho	Clobetasol propionate	1408018-01	1
Anzag	Clobetasol propionate	1408018-01	2
Noweda 19.05.2015	Clobetasol propionate	1408018-01	1
Allianz Healthcare 02.0...	Clobetasol propionate	1408018-01	1
Euro OTC	Clobetasol propionate	140801801	1
Noweda	Clobetasol propionate	1408018-01	1
Euro OTC	Clobetasol propionate	1408018-02	55
Caelo	Clobetasol propionate	1408018-02	8

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Supplier	Substance	Batch	Spectra
Caelo	Clobetasol propionate	1408018-03	5
Symbiotica/Sanacorp	Clobetasol propionate	1408018-03	1
Euro OTC	Clobetasol propionate	140801803	1
Euro OTC	Clobetasol propionate	140808-02	1
Euro OT	Clobetasol propionate	14081018-02	1
Caelo	Clobetasol propionate	14188501	5
Caelo	Clobetasol propionate	14188502	8
Caelo	Clobetasol propionate	14188503	17
Caelo	Clobetasol propionate	14188504	9
Gehe	Clobetasol propionate	14188504	1
Caelo	Clobetasol propionate	14188506	2
Fischar	Clobetasol propionate	14188506	1
sanacorp	Clobetasol propionate	14188506	1
Caelo	Clobetasol propionate	14338001	9
Caelo	Clobetasol propionate	14338005	3
Caelo	Clobetasol propionate	14338002	1
Caelo	Clobetasol propionate	14338006	9
Farmabios S.p.A./Caesar...	Clobetasol propionate	14338006	1
Caelo	Clobetasol propionate	14338007	8
Noweda	Clobetasol propionate	14338007	1
Caelo	Clobetasol propionate	14338008	4
Caelo	Clobetasol propionate	1438007	1
Fagron	Clobetasol propionate	14C03-B07	6
Fargon	Clobetasol propionate	14C03-B07	1
Fagron	Clobetasol propionate	14C03-B07-203562	1
Fagron	Clobetasol propionate	14C03-B07-293560	3
Fagron	Clobetasol propionate	14C03-B07-293561	2
Fagron	Clobetasol propionate	14C03-B07-293562	7
Fagron	Clobetasol propionate	14C03-B07-293563	1
Fagron	Clobetasol propionate	14C03-B07-305987	2
Fagron	Clobetasol propionate	14C03-B07-305986	1
Sanacorp;19.03.15;87,60EUR	Clobetasol propionate	14C03-B07-293563	1
Fagron	Clobetasol propionate	14G30B07302112	1
Caelo	Clobetasol propionate	14G30B07302114	1
Fagron	Clobetasol propionate	14G30-B07-302113	2
Fagron	Clobetasol propionate	14G30-B07-302112	1
Fagron	Clobetasol propionate	14G30-B07-302114	5
Caelo	Clobetasol propionate	14G30-B07-302114	1
Fagron	Clobetasol propionate	14G30-B07-302115	2
Fagron	Clobetasol propionate	14G30-B07-302116	4
Fagron	Clobetasol propionate	14G30-B07-303114	1
Caelo	Clobetasol propionate	14g30bo7302114	1
Fagron	Clobetasol propionate	15/15-B04-317698	1
Caelo	Clobetasol propionate	152340004	1
Caelo	Clobetasol propionate	15234001	4
Caesar&Loretz GmbH	Clobetasol propionate	15234001	1
Caelo	Clobetasol propionate	15234002	2
Alliance H.	Clobetasol propionate	15234002	2
Caelo	Clobetasol propionate	15234003	13
Sanacorp	Clobetasol propionate	15234003	1
Caelo	Clobetasol propionate	15234004	17
Euro OTC	Clobetasol propionate	15234003	1
Noweda	Clobetasol propionate	15234004	1
Caelo	Clobetasol propionate	15234009	3
allianz	Clobetasol propionate	15234009	1
Anzag	Clobetasol propionate	15246001	1
Caelo	Clobetasol propionate	1524003	1
Caelo	Clobetasol propionate	15246001	4
Caelo	Clobetasol propionate	154390504	1
Caelo	Clobetasol propionate	15439501	3

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Supplier	Substance	Batch	Spectra
Euro OTC	Clobetasol propionate	15439501	1
Caelo	Clobetasol propionate	15439502	4
Caesar&Loretz GmbH	Clobetasol propionate	15439501	1
Phoenix	Clobetasol propionate	15439502	1
Caelo	Clobetasol propionate	15439503	14
phönix	Clobetasol propionate	15439503	1
Caeolo/Noweda	Clobetasol propionate	15439503	1
phönix	Clobetasol propionate	15439504	1
Caelo	Clobetasol propionate	15439504	11
20.12.2016 Phoenix 17,49EUR	Clobetasol propionate	15439504	1
Caelo	Clobetasol propionate	15439507	3
Fagron	Clobetasol propionate	15A14-B02	1
Caelo	Clobetasol propionate	15A14-B02	1
Fagron	Clobetasol propionate	15A14-B02-303125	9
Fagron	Clobetasol propionate	15a14-b02-303125	2
Fagro/Noweda	Clobetasol propionate	15A14-B02-303125	1
Fagron	Clobetasol propionate	15C23-B02-310473	10
Fagron	Clobetasol propionate	15c23-b02-310473	3
Fagron	Clobetasol propionate	15C23-B02-310522	2
Fagron	Clobetasol propionate	15G01-B02-311578	3
Fgaron	Clobetasol propionate	15H26-B03	1
Fagron	Clobetasol propionate	15H26-B03-312860	1
Fagron	Clobetasol propionate	15H26-B03-312355	1
Fagron	Clobetasol propionate	15J15-B04-316615	1
Fagron	Clobetasol propionate	15J15-B04-317698	3
Caelo	Clobetasol propionate	15j15-b04-317698	1
Fagron	Clobetasol propionate	15j15-B04-317698	1
Caelo	Clobetasol propionate	15J15-B04-317699	1
Euro OTC	Clobetasol propionate	16042014C	1
Euro OTC	Clobetasol propionate	1606022	1
Caelo	Clobetasol propionate	160602201	1
Euro OTC	Clobetasol propionate	1606022-01	10
Euro OTC	Clobetasol propionate	160602201	2
Symbiotitica/Noweda	Clobetasol propionate	1606022-01	1
Noweda 6.4.17	Clobetasol propionate	1606022-01	1
Sanacorp	Clobetasol propionate	1606022-02	1
Euro OTC	Clobetasol propionate	1606022-02	14
EuRho/Phoenix	Clobetasol propionate	160602202	1
Noweda	Clobetasol propionate	1606022-02	1
Caelo	Clobetasol propionate	16106701	1
Gehe	Clobetasol propionate	16106701	1
Caelo	Clobetasol propionate	16106702	3
Caelo	Clobetasol propionate	16106703	6
Phönix	Clobetasol propionate	16106703	1
Caelo	Clobetasol propionate	16106704	7
Noweda/Apomix	Clobetasol propionate	16106703	1
Gehe	Clobetasol propionate	16106704	1
phönix	Clobetasol propionate	16106704	1
Caelo	Clobetasol propionate	16106707	1
Caelo	Clobetasol propionate	16106709	2
Caelo	Clobetasol propionate	16106710	4
Caelo	Clobetasol propionate	16106711	2
Caelo	Clobetasol propionate	16106712	1
Caelo	Clobetasol propionate	16106713	4
Caelo	Clobetasol propionate	16106715	2
Caelo	Clobetasol propionate	16107704	1
Caelo	Clobetasol propionate	1616703	1
Caelo	Clobetasol propionate	16353208	1
Fagron	Clobetasol propionate	16E04-B12	1
Caelo	Clobetasol propionate	16e04b12321033	1

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Supplier	Substance	Batch	Spectra
Fagron	Clobetasol propionate	16E04-B12-321034	2
Fagron	Clobetasol propionate	16E04-B12-321036	1
Caelo	Clobetasol propionate	16E04-B12-321036	1
Fagron	Clobetasol propionate	16E04-B12-322020	3
Fagron	Clobetasol propionate	16G18-B02-324627	2
Fagron	Clobetasol propionate	16G18-B02-325572	1
Fagron	Clobetasol propionate	16G18-B02-325571	1
Fagron	Clobetasol propionate	16G18-B02-325573	1
Fagron	Clobetasol propionate	16G18-B02-32571	1
Phoenix	Clobetasol propionate	16h22-b07-328012	1
Fagron	Clobetasol propionate	16H22-B07-328012	9
Fagron	Clobetasol propionate	16H22-B07-330169	1
Euro OTC	Clobetasol propionate	1704020-01	5
Caelo	Clobetasol propionate	17096702	2
Phönix	Clobetasol propionate	17096706	1
Caelo	Clobetasol propionate	17096704	1
Euro OTC	Clobetasol propionate	18111403	1
Caelo	Clobetasol propionate	2014E-02835	1
Caelo	Clobetasol propionate	2185	1
Euro OTC	Clobetasol propionate	30092014A	1
Caelo	Clobetasol propionate	39/AKD8	1
Sanacorp	Clobetasol propionate	40/AKD12	1
Euro OTC	Clobetasol propionate	4113Q-02835	1
Hedinger/ Sanacorp	Clobetasol propionate	APAPL/035/E-12C	1
Audor Pharma	Clobetasol propionate	APAPL/035/E-12C	2
Audor Pharma	Clobetasol propionate	APB0054/112010C	1
Audor Pharma	Clobetasol propionate	APCLP/M/036/16C	1
gehe	Clobetasol propionate	APCLPM03616C	1
Audor Pharma	Clobetasol propionate	APL/035/E-12C	1
Caelo	Clobetasol propionate	apl/294/b-14	1
Audor Pharma	Clobetasol propionate	APL035E12C	1
Oberlinden Apotheke	Clobetasol propionate	B0054/116010	1
Fagron	Clobetasol propionate	NT0421M	5
Oberlinden Apotheke	Clobetasol propionate	B0054/116010Mg60g	1
	Clobetasol propionate	11/29-N07	1
Euro OTC	Clobetasol propionate	1105044-04	1
Euro OTC	Clobetasol propionate	1108044-02	12
Euro OTC	Clobetasol propionate	1108044-03	19
Caelo	Clobetasol propionate	1108044-03	2
Euro OTC	Clobetasol propionate	1108044-037-16	1
Euro OTC	Clobetasol propionate	1108044-04	19
euroho/gehe	Clobetasol propionate	110804404	1
Euro OTC	Clobetasol propionate	110804404	2
Caelo	Clobetasol propionate	11300702	4
Noweda	Clobetasol propionate	11300702	2
Caelo	Clobetasol propionate	11300703	5
Fagron	Clobetasol propionate	11h10-n02	2
Fagron	Clobetasol propionate	11L12-N05	3
Caelo	Clobetasol propionate	12107601	4
Caelo	Clobetasol propionate	12107602	3
Kehr	Clobetasol propionate	12107603	1
Caelo	Clobetasol propionate	12107604	2
Gehe	Clobetasol propionate	12107606	2
Caelo	Clobetasol propionate	12107606	1
Caelo	Clobetasol propionate	12107607	9
Caelo	Clobetasol propionate	12107608	2
Sanacorp	Clobetasol propionate	12107608	1
Caelo	Clobetasol propionate	12107609	7
Euro OTC	Clobetasol propionate	121102-01	1
Euro OTC	Clobetasol propionate	1211021-01	23

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Supplier	Substance	Batch	Spectra
Euro OTC	Clobetasol propionate	121102101	2
Phönix	Clobetasol propionate	1211021-01	1
Anzag	Clobetasol propionate	1211021-02	1
Caelo	Clobetasol propionate	1211021-04	1
Euro OTC	Clobetasol propionate	121K021-01	1
Caelo	Clobetasol propionate	12342303	2
Caelo	Clobetasol propionate	12342306	9
Caelo	Clobetasol propionate	12342308	1
Caelo	Clobetasol propionate	12342310	7
Fagron	Clobetasol propionate	12A02-N04	1
Noweda	Clobetasol propionate	12E08-N04	2
Fagron	Clobetasol propionate	12e08-n04	1
Fagron	Clobetasol propionate	12E08N04	2
Fagron	Clobetasol propionate	12J25-N01	5
Alliance Healthcare	Clobetasol propionate	12J25-N01	1
Caelo	Clobetasol propionate	13134702	8
Fagron	Clobetasol propionate	13134701	1
Fagron	Clobetasol propionate	13A-N04	2
Caelo	Clobetasol propionate	20121012-4	1
Euro OTC	Clobetasol propionate	2111I-02835	1
Caelo	Clobetasol propionate	23111202	1
Caelo	Clobetasol propionate	3012Q02835	1
Euro OTC	Clobetasol propionate	CLO-BL2322/1012	3
Fagron	Clobetasol propionate	NS0486M	2
Audor Pharma	Clobetasol propionate	sieheBemerkung	1
Caelo	Clobetasol propionate	11101315	2
Anzag	Clobetasol propionate	12E08-N04	1
Phönix	Clobetasol propionate	13134701	1
GEHE	Clobetasol propionate	21022141/1	1
Caelo	Clobetasol propionate	5071301	1
Euro OTC	Clobetasol propionate	80616-1	1
Phönix	Clobetasol propionate		1
Euro OTC	Clobetasol propionate	1004036-03	1
Caelo	Clobetasol propionate	1004212835	1
Gehe	Clobetasol propionate	10D21-N04	1
Fagron	Clobetasol propionate	11/29-N07	1
Fagron	Clobetasol propionate	11-05-N06	1
Euro OTC	Clobetasol propionate	1108044	1
Euro OTC	Clobetasol propionate	1108044-01	4
Caelo	Clobetasol propionate	1108044-01	2
Phönix Gotha	Clobetasol propionate	1108044-02	1
Caelo	Clobetasol propionate	1108044-02	1
Phönix, 30.10.2012	Clobetasol propionate	1108044-03	2
Sanacorp	Clobetasol propionate	1108044-03	1
Anzag 07.03.13	Clobetasol propionate	1108044-04	3
Caelo	Clobetasol propionate	1108044-04	1
Phönix Gotha	Clobetasol propionate	1108044-04	2
Noweda	Clobetasol propionate	11101312	1
Gehe	Clobetasol propionate	11300702	1
Fagron	Clobetasol propionate	11300703	1
Caelo	Clobetasol propionate	11300704	2
Fagron	Clobetasol propionate	11D26-N04	1
Anzag	Clobetasol propionate	11H10-N02	1
Fagron	Clobetasol propionate	11H10-N02	1
Gehe	Clobetasol propionate	11L12-N05	1
Fagron	Clobetasol propionate	12/25-N01	1
Euro OTC	Clobetasol propionate	1204037-01	1
Euro OTC	Clobetasol propionate	12082013B	1
Caesar u Loretz	Clobetasol propionate	12107608	2
Euro OTC	Clobetasol propionate	12110-01	1

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Supplier	Substance	Batch	Spectra
Sanacorp	Clobetasol propionate	1211021-01	1
Gehe 02.07.2013	Clobetasol propionate	1211021-01	1
euroho/gehe	Clobetasol propionate	1211021-01	1
Fagron	Clobetasol propionate	1211021-02	1
symbiotica/gehe	Clobetasol propionate	1211021-03	1
Symbiotica Spec.	Clobetasol propionate	1211021-03	1
Caelo	Clobetasol propionate	12342302	1
Caesar/Lorenz	Clobetasol propionate	12342305	3
Alliance	Clobetasol propionate	12342305	1
Caesar & Loretz/ Noweda	Clobetasol propionate	12342306	1
Phönix	Clobetasol propionate	12342306	1
AHD, 24.05.2013	Clobetasol propionate	12342307	1
Caelo	Clobetasol propionate	12342307	2
Caesar/Lorenz	Clobetasol propionate	12342309	1
Caesar/Loretz	Clobetasol propionate	12342310	1
Noweda	Clobetasol propionate	12342310	1
Caelo	Clobetasol propionate	12342312	1
Euro OTC	Clobetasol propionate	12E08-N04	1
Fagron	Clobetasol propionate	12e08n04	1
Fagron	Clobetasol propionate	12E08-n04	1
Gehe	Clobetasol propionate	12E08-N04	1
Caelo	Clobetasol propionate	12J25-N01	1
Gehe	Clobetasol propionate	12J25-N01	1
Euro OTC	Clobetasol propionate	130604002	1
Caelo	Clobetasol propionate	13134703	4
faragon	Clobetasol propionate	13A02-N04	1
Caelo	Clobetasol propionate	13A02-N04	1
Fagron	Clobetasol propionate	13G23-N01NT0421M	1
Fagron	Clobetasol propionate	13Ao2-N04	1
Fagron	Clobetasol propionate	13G23N01	1
Fagron	Clobetasol propionate	13G23-NO1	1
Caelo	Clobetasol propionate	15031401	1
Caelo	Clobetasol propionate	24081302	1
Euro OTC	Clobetasol propionate	2405212835	1
Caelo	Clobetasol propionate	31071302	1
Caelo	Clobetasol propionate	36/AKD2	1
Phoenix 29.11.12	Clobetasol propionate	700225	2
Fagron	Clobetasol propionate	3713M-02835	1
Alliance Health 17.01.2...	Clobetasol propionate	APBOO547/112010C	1
Andor Pharma	Clobetasol propionate	APB0054/1AX011C	1
Crystal Pharma	Clobetasol propionate	C0054/1	1
Euro OTC	Clobetasol propionate	CLO-BL2153/0711	1
Symbiotica Spec./Phönix	Clobetasol propionate	CLO-Bl2153/0711	1
Noweda	Clobetasol propionate	NR0671M	1
Fagron	Clobetasol propionate	NS0292-M	1
Fagron	Clobetasol propionate	NR0671M	1
noweda	Clobetasol propionate	1004036-03	1
Symbiotica	Clobetasol propionate	121021-01	1
Sanacorp	Clobetasol propionate	12107609	2
Bombastus	Clobetasol propionate	12342303	1
Sanacorp	Clobetasol propionate	12342310	1
Caelo	Clobetasol propionate	14102416	1

- 76 058 spectra from 462 *Apo-Ident* customers from a total of 25 300 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model,

the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Clobetasol propionate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Clobetasol propionate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	466	0	71 967
Type B	0	527	41	161 505
Type C	0	1076	25	76 058

The substance/substance group *Clobetasol propionate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9887 %)	100.0000 % (> 98.7124 %)
Type B	100.0000 % (> 99.9928 %)	92.7817 % (> 92.2535 %)
Type C	100.0000 % (> 99.8849 %)	97.7293 % (> 97.4569 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21092	21092	0.00	16.46
21473	21473	0.00	22.65
21611	21611	0.00	23.12
21802	21802	0.00	39.43
21896	21896	0.00	24.25
22714	22714	0.00	18.13
22724	21092	2.45	14.39

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Clonidine hydrochloride**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20637-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Clonidine hydrochloride; Clonidini hydrochloridum; Clonidinum hydrochloricum

Special notes

When selecting the *Clonidine hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Clonidine hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Clonidine hydroc…	13I25-B07	21220	40	20131009
Fagron	Clonidine hydroc…	14H11-B04-311163	21966	40	AR-18-FG-006797-02
Fagron	Clonidine hydroc…	14H11-B04-311163	22967	40	20140929
Fagron	Clonidine hydroc…	15L11-B01-332270	23228	40	1709153
Fagron	Clonidine hydroc…	14H11-B04-311163	22967SI	40	20140929

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 200 spectra of 5 reference samples from the substance/substance group *Clonidine hydrochloride*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 233 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 282 spectra from 7 reference samples of the substance/substance group *Clonidine hydrochloride*.

- These include spectra of independent samples from 1 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Clonidine hydrochloride	12A03-N04	20637	40
Fagron	Clonidine hydrochloride	14H11-B04-311163	21966†	20
Fagron	Clonidine hydrochloride	15L11-B01-332270	23410	40
Fagron	Clonidine hydrochloride	14H11-B04-311163	not required	42
Fagron	Clonidine hydrochloride	14H11-B04-311163	21966SI	60
Fagron	Clonidine hydrochloride	15L11-B01-332270	23228SI	40
Fagron	Clonidine hydrochloride	15L11-B01-332270	23410SI	40

- 161 791 spectra from a total of 3496 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 1 spectra from 1 *Apo-Ident* customers from 1 batches from the substance/substance group *Clonidine hydrochloride*.

- These include spectra of independent samples from 1 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Clonidine hydrochloride	14H11-B04-298642	1

- 77 158 spectra from 463 *Apo-Ident* customers from a total of 25 546 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Clonidine hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Clonidine hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	200	0	72 233
Type B	0	281	1	161 791
Type C	0	1	0	77 158

The substance/substance group *Clonidine hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9928 %)	99.6454 % (> 98.5816 %)
Type C	100.0000 % (> 99.8862 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21220	21966	8.98	53.44
21966	21966	0.00	62.42
22967	23228	1.51	50.10
23228	23228	0.00	48.67

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Clotrimazole**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20000-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Clotrimazole; Clotrimazolum

Special notes

When selecting the *Clotrimazole* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Clotrimazole*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Clotrimazole	12I21-N01	20794	40	20120322
Caelo	Clotrimazole	13184113	21087	40	20130614
Caelo	Clotrimazole	13224204	21114	40	20130815
Euro OTC	Clotrimazole	1306036-01	21207	40	20130823
Fagron	Clotrimazole	14B05-B36	21259	40	20140225

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Clotrimazole	14C04-B31	21264	40	20140319
Caelo	Clotrimazole	13224220	21352	40	20130815
Euro OTC	Clotrimazole	1510003	22229	40	20151111*
Caelo	Clotrimazole	153956	23791	40	20151215*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 360 spectra of 9 reference samples from the substance/substance group *Clotrimazole*. These samples are listed above in the section *calibration samples*. The reference samples originate from 9 different batches.

- 72 073 spectra from a total of 1573 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 280 spectra from 8 reference samples of the substance/substance group *Clotrimazole*.

- These include spectra of independent samples from 6 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Clotrimazole	91457249	20000	30
Caelo	Clotrimazole	12320815	20861	30
Caelo	Clotrimazole	13224220	21353	40
Euro OTC	Clotrimazole	1510003	22229†	20
Euro OTC	Clotrimazole	1607046	22793	40

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*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Clotrimazole	1703028	23129	40
Caelo	Clotrimazole	171116	23322	40
Caelo	Clotrimazole	17111616	23781	40

- 161 793 spectra from a total of 3491 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 1678 spectra from 363 *Apo-Ident* customers from 341 batches from the substance/substance group *Clotrimazole*.

- These include spectra of independent samples from 329 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Clotrimazole	1170717	1
Euro OTC	Clotrimazole	6051501	1
Sanacorp	Clotrimazole	105/AKD1	1
hochhaus-Apotheke	Clotrimazole	916A-01276	1
Caelo	Clotrimazole	108/AKD1	1
Sanacorp	Clotrimazole	109/AKD3	1
Sanacorp	Clotrimazole	109/AKD6	1
Caelo	Clotrimazole	110/AKD7	1
Caelo	Clotrimazole	110/AKD9	1
Caelo	Clotrimazole	110/AKD8	1
Fagron	Clotrimazole	11A05-N14	2
Euro OTC	Clotrimazole	1203040-02	12
Pharmachem.Pößneck/Phoe...	Clotrimazole	12100039-02	1
Euro OTC	Clotrimazole	1210039-01	29
Euro OTC	Clotrimazole	121003901	3
EuRho	Clotrimazole	1210039-02	2
Euro OTC	Clotrimazole	1210039-02	22
Fagron	Clotrimazole	1210039-02	1
EuRho/Phoenix	Clotrimazole	1210039-02	1
Fagron	Clotrimazole		3
Caelo	Clotrimazole	12159902	15
Caelo	Clotrimazole	123456	1
Caelo	Clotrimazole	12320809	4
Fagron	Clotrimazole	12E02-N12	12
Fagron	Clotrimazole	12E30-N02	1
Euro OTC	Clotrimazole	1306036	2
Caelo	Clotrimazole	1306036	1
Caelo	Clotrimazole	1306036-01	5

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[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Supplier	Substance	Batch	Spectra
Euro OTC	Clotrimazole	1306036-01	44
Euro OTC	Clotrimazole	130603601	3
AHD 31.07.2014 EK:6,96	Clotrimazole	1306036-01	1
Caelo	Clotrimazole	130603601	1
Euro OTC	Clotrimazole	130636-01	2
Euro OTC	Clotrimazole	1309034	1
Euro OTC	Clotrimazole	1309034-01	21
Fagron	Clotrimazole	1309034-01	3
Euro OTC	Clotrimazole	130903401	5
Alliance Healthcare	Clotrimazole	1309034-01	1
Gehe	Clotrimazole	1309034-01	2
Caelo	Clotrimazole	1309034-01	1
Euro OTC	Clotrimazole	1309034-02	24
EuRho	Clotrimazole	1309034-02	1
Euro OTC	Clotrimazole	130903402	1
Caelo	Clotrimazole	1309034-02	3
eurho	Clotrimazole	1309034-02	2
Phoenix 23.10.14 5,50	Clotrimazole	1309034-02	1
Phoenix	Clotrimazole	1309034-02	1
Euro OTC	Clotrimazole		1
Caelo	Clotrimazole	1309034-C1	1
Euro OTC	Clotrimazole	1309054-02	1
Euro OTC	Clotrimazole	1314Q1276	1
Caelo	Clotrimazole	132234216	1
Caelo	Clotrimazole	13224201	26
Caelo	Clotrimazole	13224204	3
Caelo	Clotrimazole	13224210	14
Sino Phyto	Clotrimazole	13224210	2
Caelo	Clotrimazole	13224211	6
Caelo	Clotrimazole	13224212	10
gehe	Clotrimazole	13224212	1
Sanacorp	Clotrimazole	13224214	2
Caelo	Clotrimazole	13224214	11
Caelo	Clotrimazole	13224215	3
Caelo	Clotrimazole	13224216	13
Caelo	Clotrimazole	13224217	11
Noweda	Clotrimazole	13224217	1
Caelo	Clotrimazole	13224218	15
Caelo	Clotrimazole	13224219	8
Sanacorp	Clotrimazole	13224219	1
Caelo	Clotrimazole	13224220	8
Caelo	Clotrimazole	13224221	4
Vdl 14.07.14	Clotrimazole	13224225	1
Caelo	Clotrimazole	13224225	3
Caelo	Clotrimazole	13324204	1
Euro OTC	Clotrimazole	1409027	5
Noweda	Clotrimazole	1409027	1
Euro OTC	Clotrimazole	1409027-01	26
Euro OTC	Clotrimazole	140902701	2
EuRho	Clotrimazole	1409027-01	2
EuRho/Phoenix	Clotrimazole	1409027-01	1
Euro OTC	Clotrimazole	1409027-02	39
Euroo / Phönix	Clotrimazole	1409027-02	1
Caelo	Clotrimazole	1409027-02	2
Euro OTC	Clotrimazole	140902702	2
Noweda	Clotrimazole	1409027-02	1
Fagron	Clotrimazole	1409027-02	1
Euro OTC	Clotrimazole	1409027-02Mg10g	1
Euro OTC	Clotrimazole	1409027-03	14
Caelo	Clotrimazole	1409027-03	3

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Supplier	Substance	Batch	Spectra
EuroTOC / Noweda	Clotrimazole	1409027-03	1
Guangzhou Hanpu Pharmac...	Clotrimazole	1409027-03	1
Euro OTC	Clotrimazole	1409027-04	23
Caelo	Clotrimazole	1409027-04	1
Dr. Wolff	Clotrimazole	1409027-04	2
Euro OTC	Clotrimazole	140927-01	1
Euro OTC	Clotrimazole	140927-02	1
Caelo	Clotrimazole	14144905	19
Sanacorp	Clotrimazole	14144905	1
Caelo	Clotrimazole	14144911	13
Fagron	Clotrimazole	14144911	1
Caelo	Clotrimazole	14144912	2
Caelo	Clotrimazole	14144913	2
Caelo	Clotrimazole	14144914	9
Noweda 07.07.2015	Clotrimazole	14144913	1
Euro OTC	Clotrimazole	14144914	1
Caelo	Clotrimazole	14144917	8
Caelo	Clotrimazole	14144918	16
sanacorp	Clotrimazole	14144918	1
Fagron	Clotrimazole	14223201	1
Caelo	Clotrimazole	14337801	12
Berkel AHK	Clotrimazole	14337801	1
A.H.D.	Clotrimazole	14337801	1
Caelo	Clotrimazole	14337802	9
Noweda	Clotrimazole	14337801	1
Caelo	Clotrimazole	14337807	9
VDL;11.06.15;27,90EUR	Clotrimazole	14337807	1
Caesar&Loretz GmbH/Anzag	Clotrimazole	14337807	1
AHD/Hedinger	Clotrimazole	14337807	1
Caelo	Clotrimazole	14337809	16
Caelo	Clotrimazole	14337811	5
Phönix Gotha	Clotrimazole	14337811	1
Caelo	Clotrimazole	14337812	6
Fagron	Clotrimazole	14337812	1
Phoenix	Clotrimazole	14337812	1
Caelo	Clotrimazole	14337813	8
Caelo	Clotrimazole	14337814	9
Caesar&Loretz GmbH	Clotrimazole	14337814	1
Caelo	Clotrimazole	14337815	10
Caello/Anzag	Clotrimazole	14337815	1
Gehe	Clotrimazole	14337815	2
Caelo	Clotrimazole	14337816	13
Noweda	Clotrimazole	14337816	1
Caelo	Clotrimazole	14337817	13
Sanacorp	Clotrimazole	14337817	1
Caelo	Clotrimazole	14337818	10
phönix	Clotrimazole	14337818	1
Fagron	Clotrimazole	14337818	1
Caelo	Clotrimazole	14337819	4
wepa/Sanaco	Clotrimazole	14337819	1
Euro OTC	Clotrimazole	14337819	1
Caelo	Clotrimazole	14337824	1
Caelo	Clotrimazole	14337827	8
Caelo	Clotrimazole	14337828	8
Caelo	Clotrimazole	14337829	23
Euro OTC	Clotrimazole	14337829	2
Caelo	Clotrimazole	14337830	4
Caelo	Clotrimazole	14337832	1
Fagron	Clotrimazole	14B05-B35	2
Caelo	Clotrimazole	1437816	1

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Supplier	Substance	Batch	Spectra
Caelo	Clotrimazole	14B05-B35	1
Fagron	Clotrimazole	14B05-B35-293542	3
Fagron	Clotrimazole	14B05-B35-293543	1
Fagron	Clotrimazole	14B05-B35-293544	5
Fagron	Clotrimazole	14b05-b35-293544	1
Fagron	Clotrimazole	14B05-B35-294932	1
Fagron	Clotrimazole	14B05-B35-294935	3
Fagron	Clotrimazole	14B05B35294935	1
Fagron	Clotrimazole	14b05-b35-294935	1
Fagron	Clotrimazole	14B05-B35-299941	2
Fagron	Clotrimazole	14b05-b35-299941	1
Fagron	Clotrimazole	14B05-B36	8
Apomix	Clotrimazole	14B05-B36	1
Fagron	Clotrimazole	14B05-B36-291165	3
Fagron	Clotrimazole	14B05-B36-291166	3
Fagron	Clotrimazole	14b05b36291166	1
Fagron	Clotrimazole	14b05-b36-291166	1
Fagron	Clotrimazole	14B05-B36-291167	7
Fagron	Clotrimazole	14b05-B36-291167	1
Caelo	Clotrimazole	14B05-B36-291167	1
Fagron	Clotrimazole	14B05-B36-291168	2
Fagron	Clotrimazole	14B05-B36-2991166	1
Fagron	Clotrimazole	14B06-B06-299942	1
Fagron	Clotrimazole	14B06-B06	1
Fagron	Clotrimazole	14B06-B06-299943	5
Fagron	Clotrimazole	14C04-B30	2
Fagron	Clotrimazole	14C04-B30-291656	10
Caelo	Clotrimazole	14c04-b30-291656	1
Caelo	Clotrimazole	14C04-B30-291656	2
	Clotrimazole	14C04-B30-291661	1
Fagron	Clotrimazole	14C04-B30-291661	3
Anzag	Clotrimazole	14C04-B30-2916618	1
Fagron	Clotrimazole	14C04-B31	9
Phoenix	Clotrimazole	14c04b31	1
Fagron	Clotrimazole	14C04B31	1
Caelo	Clotrimazole	14c04-B31	1
Fagron	Clotrimazole	14C04-B31-291660	2
Euro OTC	Clotrimazole	14C04-B31-291660	1
Fagron	Clotrimazole	14C04-B31-294939	7
Caelo	Clotrimazole	14C04-B31-294939	1
Gehe	Clotrimazole	14C04-B31-294952	1
Fagron	Clotrimazole	14C04-B31-294952	1
Fagron	Clotrimazole	14C04-B31-294940	1
Fagron	Clotrimazole	14C04-B31-299954	9
Caelo	Clotrimazole	14c04-b31-299954	2
Caelo	Clotrimazole	14C04B31-299954	1
Caelo	Clotrimazole	14C04-B31-299955	1
Fagron	Clotrimazole	14C04-B31-299955	1
Fagron	Clotrimazole	14C04-B31-299959	2
Fagron	Clotrimazole	14C04-B31-299960	6
Fagron	Clotrimazole	14C04-B32	2
Fagron	Clotrimazole	14C04B32291657	1
Caelo	Clotrimazole	14C04-B32-291657	1
Fagron	Clotrimazole	14C04-B32-291657	1
Caelo	Clotrimazole	150003-02	1
Euro OTC	Clotrimazole	15042014C	1
Euro OTC	Clotrimazole	15072014A	1
Euro OTC	Clotrimazole	1510003-01	32
Noweda	Clotrimazole	1510003-01	2
Caelo	Clotrimazole	1510003-01	2

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Supplier	Substance	Batch	Spectra
Guangzhou Hanpu Pharmac...	Clotrimazole	1510003-01	1
Fagron	Clotrimazole	1510003-01	1
Euro OTC	Clotrimazole	1510003-02	14
Guangzhou Hanpu Pharmac...	Clotrimazole	1510003-02	1
Euro OTC	Clotrimazole	151003-01	1
Caelo	Clotrimazole	15395602	17
Caelo	Clotrimazole	15395603	4
Caelo	Clotrimazole	15395604	11
Euro OTC	Clotrimazole	15395604	1
Caelo	Clotrimazole	15395605	7
Caelo	Clotrimazole	1539561	1
Anzag	Clotrimazole	15395610	1
Caelo	Clotrimazole	15395610	4
Caelo	Clotrimazole	15395611	9
Caelo	Clotrimazole	15395613	5
Caesar u Loretz	Clotrimazole	15395613	1
Caelo	Clotrimazole	15395614	4
caesar&loretz GmbH,Phön...	Clotrimazole	15395614	1
Caelo	Clotrimazole	15395615	4
Caelo	Clotrimazole	15395617	8
Hedinger/Alliance H.	Clotrimazole	15395617	1
Caelo	Clotrimazole	15395618	10
Phönix	Clotrimazole	15395618	1
Caelo	Clotrimazole	15395623	1
Caelo	Clotrimazole	153965604	1
Caelo	Clotrimazole	156546	1
Fagron	Clotrimazole	15C14-B05-311100	1
Fagron	Clotrimazole	15G14-B05	5
Gehe	Clotrimazole	15G14-B05	1
Fagron	Clotrimazole	15G14-B05-311100	12
Noweda/Apomix	Clotrimazole	15G14-B05-311100	1
Fagron	Clotrimazole	15G14-B05-311101	1
Sanacorp	Clotrimazole	15g14-b05-311100	1
Caelo	Clotrimazole	15G14-B05-311101	1
Fagron	Clotrimazole	15G14-B05-311102	1
Fagron	Clotrimazole	15G14-B05-311103	8
Caelo	Clotrimazole	15G14-B05-316483	1
Fagron	Clotrimazole	15G14-B05-316483	1
Fagron	Clotrimazole	15G14-B06	2
Anzag	Clotrimazole	15G14-B06	1
Fagron	Clotrimazole	15G14-B06-31105	1
Fagron	Clotrimazole	15g14-b06-311054	1
Fagron	Clotrimazole	15G14-B06-311054	4
Fagron	Clotrimazole	15G14B06311054	1
Caelo	Clotrimazole	15G14-B06-311054	1
Caelo	Clotrimazole	15G14-B06-311057	1
Fagron	Clotrimazole	15G14-B06-311055	1
AHD 27.10 Ek.7,07	Clotrimazole	1607046	1
Fagron	Clotrimazole	15G14-Bo5-311101	1
Euro OTC	Clotrimazole	1607046	1
Euro OTC	Clotrimazole	1607046-01	31
Euro OTC	Clotrimazole	1607046-0	1
Euro OTC	Clotrimazole	160704601	3
Bombastus	Clotrimazole	1607046-01	2
Caelo	Clotrimazole	1607046-01	1
Fagron	Clotrimazole	1607046-02	1
Euro OTC	Clotrimazole	1607046-02	7
Caelo	Clotrimazole	1607046-02	2
EuRho/ Phoenix	Clotrimazole	160704602	1
Euro OTC	Clotrimazole	1607046-2	1

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Supplier	Substance	Batch	Spectra
Euro OTC	Clotrimazole	1607064-01	1
Caesar u Loretz	Clotrimazole	16234501	1
Caelo	Clotrimazole	16234501	4
Caelo	Clotrimazole	16234502	2
Caelo	Clotrimazole	16234503	6
Caelo	Clotrimazole	16234504	4
Caelo	Clotrimazole	16234505	8
Phönix	Clotrimazole	16234505	1
Euro OTC	Clotrimazole	16234505	1
Caelo	Clotrimazole	16234506	1
Caelo	Clotrimazole	16234509	2
Caelo	Clotrimazole	16234511	4
Caesar&Loretz GmbH,15.0...	Clotrimazole	16234509	1
Fargon	Clotrimazole	16234511	1
phönix	Clotrimazole	16234512	1
Noweda	Clotrimazole	16234511	1
Gehe	Clotrimazole	16234513	1
Caelo	Clotrimazole	16234513	5
Caelo	Clotrimazole	16234515	1
Caelo	Clotrimazole	16234517	1
Caelo	Clotrimazole	16234520	2
Caelo	Clotrimazole	16234522	1
Caelo	Clotrimazole	16234521	1
Fagron	Clotrimazole	16B09-B06-311507	3
Fagron	Clotrimazole	16B09-B06	1
Fagron	Clotrimazole	16B09-B06-311506	1
Fagron	Clotrimazole	16B09-B06-311785	2
Fagron	Clotrimazole	16B11-B04-320088	3
Euro OTC	Clotrimazole	16B11-B04-320088	1
Fagron	Clotrimazole	16B11-B04-327611	1
Fagron	Clotrimazole	16B11-B04-327579	1
Fagron	Clotrimazole	16E20-B10-321597	2
Fagron	Clotrimazole	16E20-B10-321598	4
Fagron	Clotrimazole	16E20-B10-32197	1
Fagron	Clotrimazole	16E20-B10-324555	1
Fargron / Noweda	Clotrimazole	16E20-B10-324555	1
Fagron	Clotrimazole	16E20-B10-326010	1
Fagron	Clotrimazole	16E20-B10-327349	1
Caelo	Clotrimazole	16J07-B02-329386	3
Caelo	Clotrimazole	17011601	1
Fagron	Clotrimazole	16J07-B02-330216	1
Euro OTC	Clotrimazole	1703028-01	12
Alliance/Euro	Clotrimazole	1703028-01	1
EuRho / Phoenix	Clotrimazole	1703028-01	1
Euro OTC	Clotrimazole	170302801	1
Caelo	Clotrimazole	170302801	2
Euro OTC	Clotrimazole	1703028-02	2
Hedinger/Gehe	Clotrimazole	1703028-02	1
Caelo	Clotrimazole	17111603	1
Caelo	Clotrimazole	17111604	1
Caelo	Clotrimazole	17111605	1
Caelo	Clotrimazole	17111613	1
Fagron	Clotrimazole	17A19-B04332114	1
Euro OTC	Clotrimazole	20130512	1
Euro OTC	Clotrimazole	20160801	1
Oberlinden Apotheke	Clotrimazole	201401300378	2
Euro OTC	Clotrimazole	21052015B	1
Euro OTC	Clotrimazole	22122014B	1
Euro OTC	Clotrimazole	23121408	1
Euro OTC	Clotrimazole	2214A-01276	1

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Supplier	Substance	Batch	Spectra
Caelo	Clotrimazole	415050-2-P	1
Euro OTC	Clotrimazole	700135	2
Audor Pharma	Clotrimazole	APCLT/1703/0016CC	1
Audor Pharma	Clotrimazole	AP1306036-01C	1
Caelo	Clotrimazole		6
Caelo	Clotrimazole	418072-1-P	1
Fagron	Clotrimazole	CLT/1307/0065A	2
Fagron	Clotrimazole	CLT/1604/00227A	1
Caelo	Clotrimazole	Fagron	1
Caelo	Clotrimazole	1882321	1
Caelo	Clotrimazole	311111	1
Fagron	Clotrimazole	9041304	1
Euro OTC	Clotrimazole	1006044-02	1
Noweda	Clotrimazole	10247316	1
Caelo	Clotrimazole	10247328	3
Gehe	Clotrimazole	10247328	1
Kehr	Clotrimazole	10247331	1
Kehr	Clotrimazole	10247332	2
Caelo	Clotrimazole	10247332	1
Caelo	Clotrimazole	11/22-N10	1
Euro OTC	Clotrimazole	1105014-01	1
Euro OTC	Clotrimazole	1105014-02	3
Caelo	Clotrimazole	1105014-02	1
Euro OTC	Clotrimazole	110501402	1
Phönix Gotha	Clotrimazole	1108053-01	2
Euro OTC	Clotrimazole	110805301	1
Euro OTC	Clotrimazole	1108053-01	5
Gehe	Clotrimazole	1108053-01	1
Euro OTC	Clotrimazole	1108053-02	6
Caelo	Clotrimazole	1108053-02	1
Phönix Gotha	Clotrimazole	1108053-02	2
Caelo	Clotrimazole	11081201	1
EuRho	Clotrimazole	1108053-02	1
Fagron	Clotrimazole	11101209	1
Caelo	Clotrimazole	11305505	2
Caelo	Clotrimazole	11305506	3
Caelo	Clotrimazole	11305507	2
Caelo	Clotrimazole	11305511	1
phönix	Clotrimazole	11305513	1
Caelo	Clotrimazole	11305513	9
Fagron	Clotrimazole	11E17-N10	3
Fagron	Clotrimazole	11G15-N10	1
Fagron	Clotrimazole	11D01-N06	1
Caelo	Clotrimazole	11-K21-N19	1
Gehe	Clotrimazole	11K21-N19	2
Fagron	Clotrimazole	11K21-N19	1
Fagron	Clotrimazole	11k21-n19	1
Noweda	Clotrimazole	11K21-N19	2
Fagron	Clotrimazole	11L12-N10	5
FARGON	Clotrimazole	11l12-n10	1
Fagron	Clotrimazole	12/21-N01	5
Großhandel	Clotrimazole	12/21-N04	1
Fagron	Clotrimazole	12/21-N04	4
Anzag,12.11.2012	Clotrimazole	1203040	1
Euro OTC	Clotrimazole	1203040	1
Euro OTC	Clotrimazole	1203040-01	3
Europharm/Otto	Clotrimazole	1203040-01	1
Europharm/Otto	Clotrimazole	1203040-02	1
Gehe	Clotrimazole	1203040-02	1
EuRho	Clotrimazole	1203040-02	1

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Supplier	Substance	Batch	Spectra
Euro OTC	Clotrimazole	120304002	1
Euro OTC	Clotrimazole	1203040-03	10
Noweda	Clotrimazole	1203040-03	2
Sanacorp	Clotrimazole	1203040-03	1
Anzag 30.01.2013	Clotrimazole	1203040-03	2
GEHE	Clotrimazole	1203040-03	1
Gehe/EuRho	Clotrimazole	1203040-03	1
Euro OTC	Clotrimazole	1209211276	1
Euro OTC	Clotrimazole	12082013C	1
Caelo	Clotrimazole	1210030-02	1
Phönix	Clotrimazole	1210039-01	1
EuRho	Clotrimazole	1210039-01	1
Fagron	Clotrimazole	1210039-01	1
Caelo	Clotrimazole	1210039-01	1
Euro/Noweda	Clotrimazole	1210039-01	1
Phönix, 28.10.2013	Clotrimazole	1210039-02	1
Gehe	Clotrimazole	121003902	1
EuRho/Phönix	Clotrimazole	1210039-2	1
Caelo	Clotrimazole	1210039-02	1
Stumpf	Clotrimazole	12159902	1
Sanacorp	Clotrimazole	12159902	1
Caelo	Clotrimazole	12159904	2
Kehr	Clotrimazole	12159904	1
Caelo	Clotrimazole	12159911	2
Phönix/ henry lamotte	Clotrimazole	12159911	1
Caelo	Clotrimazole	12159913	9
Caelo	Clotrimazole	12159916	6
Fagron	Clotrimazole	1221N04	1
Fagron	Clotrimazole	1221n04	1
Sanacorp	Clotrimazole	1230805	1
Caelo	Clotrimazole	1230809	1
Caelo	Clotrimazole	12320806	6
Caelo	Clotrimazole	12320805	4
Caelo	Clotrimazole	12320807	5
Caelo	Clotrimazole	12320808	11
phönix	Clotrimazole	12320809	1
Caelo	Clotrimazole	12320813	3
Caelo	Clotrimazole	12320814	10
Caesar/Lorenz	Clotrimazole	12320814	1
Caelo	Clotrimazole	12320815	3
Bombastus	Clotrimazole	12320815	1
Caelo	Clotrimazole	1234567	1
Caelo	Clotrimazole	1259913	1
Fagron	Clotrimazole	12A05-N10	7
Fagron	Clotrimazole	12a05-n10	1
Caelo	Clotrimazole	12B27-N05	2
Phoenix	Clotrimazole	12A05-N10	1
Fagron	Clotrimazole	12B27-N05	4
Fagron	Clotrimazole	12e02-N12	1
Noweda	Clotrimazole	12E02-N12	1
Fagron	Clotrimazole	12E30-N07	13
Caelo	Clotrimazole	12E30-N07	1
Fiebig 10.06.13 ek: 8,58EUR	Clotrimazole	12E30-N07	1
Fagron	Clotrimazole	12F02-N12	1
Fagron	Clotrimazole	12I16-N04	1
Euro OTC	Clotrimazole	12I21-N01	1
Fagron	Clotrimazole	12I21-N01	8
Fagron	Clotrimazole	12I21-N04	9
Fagron	Clotrimazole	12I21N04	1
FARGON	Clotrimazole	12i21-n04	1

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Supplier	Substance	Batch	Spectra
Caelo	Clotrimazole	12I21-N04	1
Fagron	Clotrimazole	12K15-N01	1
anzag,18.01.2013	Clotrimazole	12l21-N04	1
Fagron	Clotrimazole	12l21-N04	2
FARGON	Clotrimazole	12l21-n04	1
Fagron	Clotrimazole	12l21-n04	1
Gehe/EuRho	Clotrimazole	12o3040-03	1
EuRho	Clotrimazole	1306036-01	2
Gehe	Clotrimazole	1306036-01	4
Großhandel	Clotrimazole	1306036-01	1
PHOENIX am 22.01.2014	Clotrimazole	1306036-01	1
	Clotrimazole	1306036-01	1
Caelo	Clotrimazole	13148007	1
Caelo	Clotrimazole	13184103	13
Gehe	Clotrimazole	13184103	1
Caelo	Clotrimazole	13184105	15
Sanacorp	Clotrimazole	13184105	1
Europ Ots Pharma	Clotrimazole	13184105	1
Caelo	Clotrimazole	13184111	7
Caesar&Loretz GmbH/Anzag	Clotrimazole	13184111	1
Caelo	Clotrimazole	13184113	4
Caelo	Clotrimazole	131841111	1
Caelo	Clotrimazole	1322401	1
Noweda	Clotrimazole	13224201	1
Phoenix	Clotrimazole	13224215	1
Gehe	Clotrimazole	13224216	1
Fagron	Clotrimazole	13C25-N10	12
Phönix	Clotrimazole	13C25-N10	1
Euro OTC	Clotrimazole	14090027-01	1
Caesar&loretz,Phoenix	Clotrimazole	14144912	1
Phönix	Clotrimazole	14337809	1
Fagron	Clotrimazole	14Coa-B30-291656	1
Fagron	Clotrimazole	20100603	1
Fagron	Clotrimazole	20111018	4
Fagron	Clotrimazole	20110113	1
Caelo	Clotrimazole	20111018	1
Fischar/Gehe	Clotrimazole	20111018	1
Sanacorp	Clotrimazole	20111018	1
Caelo	Clotrimazole	20111115	1
Euro OTC	Clotrimazole	20111115	1
Noweda	Clotrimazole	20111115	1
Fagron	Clotrimazole	20120603	4
Caelo	Clotrimazole	20130207	1
Fagron	Clotrimazole	20151112-3	1
Caelo	Clotrimazole	26071305	1
Euro OTC	Clotrimazole	21122013A	1
Euro OTC	Clotrimazole	2313M01276	1
Euro OTC	Clotrimazole	30011402	1
Caelo	Clotrimazole	3513M-01276	1
Euro OTC	Clotrimazole	3912E-01276	1
Fagron	Clotrimazole	4812E-01276(NP)	1
Caelo	Clotrimazole	412091-2-P	1
Caelo	Clotrimazole	700135-0006	1
Fagron	Clotrimazole	C22H17CIN2	1
Caelo	Clotrimazole	PC85	1
EUro/AHD	Clotrimazole	1210039-01	2
Gehe	Clotrimazole	12/21-N01	1
Sanacorp	Clotrimazole	12320814	1
Fagron	Clotrimazole	12b27-n05	1
Fagron	Clotrimazole	12E02N12	1

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Supplier	Substance	Batch	Spectra
Anzag	Clotrimazole	12I21-N04	1
europharma	Clotrimazole	1306036-01	1
Euro OTC	Clotrimazole	1306306-01	1
AHD	Clotrimazole	13184105	1
Fagron	Clotrimazole	13224201	1

- 75 481 spectra from 463 *Apo-Ident* customers from a total of 25 211 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Clotrimazole* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Clotrimazole* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	360	0	72 073
Type B	0	280	0	161 793
Type C	0	1642	36	75 481

The substance/substance group *Clotrimazole* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9887 %)	100.0000 % (> 98.3333 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 97.8571 %)
Type C	100.0000 % (> 99.8849 %)	97.8546 % (> 97.6758 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

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Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20794	22229	2.46	45.02
21087	22229	2.71	45.66
21114	22229	3.37	43.76
21207	22229	4.99	42.13
21259	22229	5.34	40.24
21264	22229	5.17	41.57
21352	22229	3.53	45.44
22229	22229	0.00	47.35
23791	23791	0.00	44.20

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Colistin sulfate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20318-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Colistin sulfate; Colistin sulphate; Colistini sulfas; Colistinum sulfuricum

Special notes

When selecting the *Colistin sulfate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Colistin sulfate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Colistin sulfate	13G05-N01	20915	40	20130719
Fagron	Colistin sulfate	14E02-B03	21346	40	1501654
Euro OTC	Colistin sulfate	1406001-01	21619	40	1508600
Euro OTC	Colistin sulfate	1507044	21852	40	20150817*
Euro OTC	Colistin sulfate	1602021	22371	40	20160307*

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Colistin sulfate	1606008	22695	40	20160704*
Fagron	Colistin sulfate	16F03-B01-324216	22973	40	20160706
Audor	Colistin sulfate	APKB-CS-1603034C	23026	40	20160627

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 320 spectra of 8 reference samples from the substance/substance group *Colistin sulfate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 8 different batches.

- 72 113 spectra from a total of 1574 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 345 spectra from 10 reference samples of the substance/substance group *Colistin sulfate*.

- These include spectra of independent samples from 5 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Colistin sulfate	07I18-N05	20318	40
Fagron	Colistin sulfate	13G05-N01	21209	40
Euro OTC	Colistin sulfate	1406001-01	21619†	20
Euro OTC	Colistin sulfate	1406002-01	21700	45
Euro OTC	Colistin sulfate	1507044	21852†	20
Euro OTC	Colistin sulfate	1602021	22371†	20

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*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Supplier	Substance	Batch	Sample ID	Spectra
Audor Pharma	Colistin sulfate	APKB-CS-1602026C	22974	40
Audor Pharma	Colistin sulfate	APKB-CS-1602026C	23027	40
Euro OTC	Colistin sulfate	1709009	23616	40
Caelo	Colistin sulfate	1710041	23866	40

- 161 728 spectra from a total of 3490 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 10 spectra from 4 *Apo-Ident* customers from 8 batches from the substance/substance group *Colistin sulfate*.

- These include spectra of independent samples from 7 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Euro OTC	Colistin sulfate	1507044-01	1
Fagron	Colistin sulfate	15E15-B01-315340	1
Fagron	Colistin sulfate	16F03-B01	2
Euro OTC	Colistin sulfate	1606008-01	1
Fagron	Colistin sulfate	16J03-B10	1
Audor Pharma	Colistin sulfate	APKB-CS-1601026C	1
Audor Pharma	Colistin sulfate	APKB-CS-1603034C	2
Audor Pharma	Colistin sulfate	APKB-CS-1610012C	1

- 77 149 spectra from 463 *Apo-Ident* customers from a total of 25 539 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Colistin sulfate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Colistin sulfate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

	False positive	True positive	False negative	True negative
Type A	0	320	0	72 113
Type B	0	305	40	161 728
Type C	0	10	0	77 149

The substance/substance group *Colistin sulfate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9887 %)	100.0000 % (> 98.1250 %)
Type B	100.0000 % (> 99.9928 %)	88.4058 % (> 87.5362 %)
Type C	100.0000 % (> 99.8851 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20915	21619	4.55	25.73
21346	21346	0.00	27.74
21619	21619	0.00	26.72
21852	21852	0.00	26.93
22371	22371	0.00	24.19
22695	22695	0.00	29.34
22973	21852	2.12	25.71
23026	21346	13.99	29.47

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Colophony**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20627-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Colophony; Colophonium

Special notes

When selecting the *Colophony* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Colophony*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Colophony	12301410	21782	40	AR-15-FG-016314-01
Caelo	Colophony	15186804	21971	40	AR-16-FG-005931-01
Caelo	Colophony	161332	22588	40	20160510*
Caelo	Colophony	173014	24052	40	20180102*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 4 reference samples from the substance/substance group *Colophony*. These samples are listed above in the section *calibration samples*. The reference samples originate from 4 different batches.

- 72 273 spectra from a total of 1578 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 128 spectra from 5 reference samples of the substance/substance group *Colophony*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Colophony	10147506	20627	40
Caelo	Colophony	12301410	21782†	20
Caelo	Colophony	15186804	21971†	20
Caelo	Colophony	173014	23794	40
Caelo	Colophony	15186807	not required	8

- 161 945 spectra from a total of 3494 batches from further 863 substances. These spectra were

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 0 spectra from 0 *Apo-Ident* customers from 0 batches from the substance/substance group *Colophony*.

- These include spectra of independent samples from 0 batches, of which no spectra have been used for the generation of the database.

- 77 159 spectra from 463 *Apo-Ident* customers from a total of 25 547 batches from a further 701 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Colophony* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Colophony* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	72 273
Type B	0	121	7	161 945
Type C	0	0	0	77 159

The substance/substance group *Colophony* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9928 %)	94.5313 % (> 92.1875 %)
Type C	100.0000 % (> 99.8849 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21782	21782	0.00	94.64
21971	21971	0.00	35.55
22588	22588	0.00	88.18
24052	24052	0.00	43.05

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Cyanocobalamin**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	21299-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Cyanocobalamin; Cyanocobalaminum

Special notes

When selecting the *Cyanocobalamin* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Cyanocobalamin*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Cyanocobalamin	13342803	21299	40	AR-15-FG-005429-01
Caelo	Cyanocobalamin	13342807	21479	40	AR-15-FG-014917-01
Euro OTC	Cyanocobalamin	1305040-01	21635	40	AR-15-FG-005214-01
Euro OTC	Cyanocobalamin	1506035	21867	40	20150708*
Euro OTC	Cyanocobalamin	1506035	21872	40	0000010479

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Cyanocobalamin	160154	22441	40	20160309*
Euro OTC	Cyanocobalamin	1604017	22536	30	20160509*
Caelo	Cyanocobalamin	13342807	21479SI	20	AR-15-FG-014917-01
Euro OTC	Cyanocobalamin	1506035	21867SI	40	20150708*
Euro OTC	Cyanocobalamin	1506035	21872SI	30	0000010479
Caelo	Cyanocobalamin	160154	22441SI	40	20160309*
Euro OTC	Cyanocobalamin	1604017	22536SI	30	20160509*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 430 spectra of 12 reference samples from the substance/substance group *Cyanocobalamin*. These samples are listed above in the section *calibration samples*. The reference samples originate from 6 different batches.

- 72 003 spectra from a total of 1576 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 325 spectra from 13 reference samples of the substance/substance group *Cyanocobalamin*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Cyanocobalamin	09351704	20858	40
Caelo	Cyanocobalamin	13342807	21479†	20

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*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Cyanocobalamin	1305040-01	21635†	20
Euro OTC	Cyanocobalamin	1506035	21867†	20
Euro OTC	Cyanocobalamin	1506035	21872†	20
Caelo	Cyanocobalamin	160154	22441†	20
Caelo	Cyanocobalamin	16015411	23761	40
Caelo	Cyanocobalamin	162215	23790	40
Caelo	Cyanocobalamin	13342807	21479SI†	40
Euro OTC	Cyanocobalamin	1506035	21867SI†	20
Euro OTC	Cyanocobalamin	1506035	21872SI†	15
Caelo	Cyanocobalamin	160154	22441SI†	20
Euro OTC	Cyanocobalamin	1604017	22536SI†	10

- 161 748 spectra from a total of 3491 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 20 spectra from 14 *Apo-Ident* customers from 15 batches from the substance/substance group *Cyanocobalamin*.

- These include spectra of independent samples from 15 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Cyanocobalamin	14183301	1
Fagron	Cyanocobalamin	13I24-B01-292062	1
Fagron	Cyanocobalamin	15F25-B05	1
Caelo	Cyanocobalamin	1604017-01	1
Euro OTC	Cyanocobalamin	5061204	1
Caesar & Loretz GmbH, 4...	Cyanocobalamin	9324102	1
Caelo	Cyanocobalamin	9351704	1
Fagron	Cyanocobalamin	10K02-N05	4
Fagron	Cyanocobalamin	10K02-N05	1
Fagron	Cyanocobalamin	13124-B01-292062	1
Caelo	Cyanocobalamin	9324102	1
Caelo	Cyanocobalamin	9336904	1
Caelo	Cyanocobalamin	9324113	1
Caelo	Cyanocobalamin	9336907	1
Caelo	Cyanocobalamin	9373503	2
Fagron	Cyanocobalamin	15H31-B02-315113	1

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

- 77 139 spectra from 463 *Apo-Ident* customers from a total of 25 532 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Cyanocobalamin* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Cyanocobalamin* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	430	0	72 003
Type B	0	301	24	161 748
Type C	0	13	7	77 139

The substance/substance group *Cyanocobalamin* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9887 %)	100.0000 % (> 98.6047 %)
Type B	100.0000 % (> 99.9928 %)	92.6154 % (> 91.6923 %)
Type C	100.0000 % (> 99.8850 %)	65.0000 % (> 50.0000 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21299	21299	0.00	16.92
21479	21479	0.00	26.52
21635	21635	0.00	21.99
21867	21867	0.00	21.77
21872	21872	0.00	14.82
22441	22441	0.00	29.33
22536	22536	0.00	36.58

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Cyproterone acetate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20593-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Cyproterone acetate; Cyproteroni acetas; Cyproteronum aceticum

Special notes

When selecting the *Cyproterone acetate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Cyproterone acetate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Cyproterone acet…	13C11-N02	21262	40	1501534
Fagron	Cyproterone acet…	13J16-No4	21985	55	1602654
Fagron	Cyproterone acet…	15I11-B01-322117	22665	40	20150921
Euro OTC	Cyproterone acet…	1611003	22875	40	20161201*
Fagron	Cyproterone acet…	17D11-B07-333693	23238	40	20170501
Fagron	Cyproterone acet…	17D11-B07-333693	23238SI	20	20170501

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 235 spectra of 6 reference samples from the substance/substance group *Cyproterone acetate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 5 different batches.

- 72 198 spectra from a total of 1577 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 246 spectra from 8 reference samples of the substance/substance group *Cyproterone acetate*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Cyproterone acetate	12B14-N06	20593	40
Fagron	Cyproterone acetate	11L22-N02	20603	40
Fagron	Cyproterone acetate	13J16-No4	21985†	20
Audor Pharma	Cyproterone acetate	APCPA140201CP	23988	40
Fagron	Cyproterone acetate	13J16-No4	21985SI	23
Fagron	Cyproterone acetate	15I11-B01-322117	22665SI	33
Euro OTC	Cyproterone acetate	1611003	22875SI	30
Audor Pharma	Cyproterone acetate	APCPA140201CP	23988SI	20

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 827 spectra from a total of 3493 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 34 spectra from 20 *Apo-Ident* customers from 23 batches from the substance/substance group *Cyproterone acetate*.

- These include spectra of independent samples from 23 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Cyproterone acetate	8B11-N06	1
Fagron	Cyproterone acetate	12L19-N05	2
Fagron	Cyproterone acetate	13/09-N03	1
Fagron	Cyproterone acetate	13/16-N04	2
Fagron	Cyproterone acetate	13I09-N03	1
Fagron	Cyproterone acetate	13J16-N04	4
Fagron	Cyproterone acetate	13j16n04	1
Caelo	Cyproterone acetate	13j16-n04	1
Fagron	Cyproterone acetate	13j16-no4	1
Fagron	Cyproterone acetate	15I11-B01	1
Fagron	Cyproterone acetate	15I11-B01-315381	2
Fagron	Cyproterone acetate	16K09-B04	1
Ebert-Jacobi	Cyproterone acetate	16K09-B04-329036	1
Fagron	Cyproterone acetate	17D11-B07-338440	1
Fagron	Cyproterone acetate	APCPA130201C	1
Audor Pharma	Cyproterone acetate	APCPA140201CP	1
Caelo	Cyproterone acetate	B0392/110020	3
Fagron	Cyproterone acetate	B0392/110020	2
Caelo	Cyproterone acetate	CPA150301	1
Fagron	Cyproterone acetate	12D02-N13	1
Fagron	Cyproterone acetate	EU-CPA-170301	1
Fagron	Cyproterone acetate	11L22-N02	1
Fagron	Cyproterone acetate	12F25-N09	2
Fagron	Cyproterone acetate	12J24-N02	1

- 77 125 spectra from 463 *Apo-Ident* customers from a total of 25 524 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Cyproterone acetate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Cyproterone acetate* and it was

evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	235	0	72 198
Type B	0	221	25	161 827
Type C	0	21	13	77 125

The substance/substance group *Cyproterone acetate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.4468 %)
Type B	100.0000 % (> 99.9928 %)	89.8374 % (> 88.6179 %)
Type C	100.0000 % (> 99.8850 %)	61.7647 % (> 52.9412 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21262	21262	0.00	38.95
21985	21985	0.00	42.59
22665	21985	7.78	40.58
22875	22875	0.00	38.19
23238	21985	7.44	38.88

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Cysteine hydrochloride monohydrate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20530-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Cysteine hydrochloride monohydrate; Cysteini hydrochloridum monohydricum; Cysteinum hydrochloricum

Special notes

When selecting the *Cysteine hydrochloride monohydrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Cysteine hydrochloride monohydrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Cysteine hydroch…	1304019-01	21325	30	20130517
Euro OTC	Cysteine hydroch…	1507006	21840	40	20150713*
Euro OTC	Cysteine hydroch…	1701012	23003	40	20170207*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 110 spectra of 3 reference samples from the substance/substance group *Cysteine hydrochloride monohydrate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 323 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 290 spectra from 8 reference samples of the substance/substance group *Cysteine hydrochloride monohydrate*.

- These include spectra of independent samples from 6 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Dr. Behr	Cysteine hydrochloride monoh…	P-07014800	20422	40
Euro OTC	Cysteine hydrochloride monoh…	1112015-01	20530	40
Euro OTC	Cysteine hydrochloride monoh…	1112015-02	20630	40
Euro OTC	Cysteine hydrochloride monoh…	1304019-01	21325†	10
Euro OTC	Cysteine hydrochloride monoh…	1507006	21840†	20
Euro OTC	Cysteine hydrochloride monoh…	1510015	21941	60
Euro OTC	Cysteine hydrochloride monoh…	1603018	22516	40
Euro OTC	Cysteine hydrochloride monoh…	1706023	23548	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 783 spectra from a total of 3491 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 17 spectra from 4 *Apo-Ident* customers from 7 batches from the substance/substance group *Cysteine hydrochloride monohydrate*.

- These include spectra of independent samples from 6 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Euro OTC	Cysteine hydrochloride monoh…	1311040-01	2
Euro OTC	Cysteine hydrochloride monoh…	1408003-01	4
Euro OTC	Cysteine hydrochloride monoh…	14080031-01	1
Euro OTC	Cysteine hydrochloride monoh…	1112015-01	2
Euro OTC	Cysteine hydrochloride monoh…	1304019-01	5
Euro OTC	Cysteine hydrochloride monoh…	1206015-01	2
Euro OTC	Cysteine hydrochloride monoh…	1603018-01	1

- 77 142 spectra from 463 *Apo-Ident* customers from a total of 25 540 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Cysteine hydrochloride monohydrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Cysteine hydrochloride monohydrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	110	0	72 323
Type B	0	284	6	161 783
Type C	0	16	1	77 142

The substance/substance group *Cysteine hydrochloride monohydrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 94.5455 %)
Type B	100.0000 % (> 99.9928 %)	97.9310 % (> 96.8966 %)
Type C	100.0000 % (> 99.8850 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21325	21840	2.26	14.61
21840	21840	0.00	11.92
23003	23003	0.00	8.43

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Cystine**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20515-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Cystine; Cystinum

Special notes

When selecting the *Cystine* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Cystine*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Cystine	1307052-01	21328	40	20130918
Euro OTC	Cystine	1408016-01	21715	40	20140911
Euro OTC	Cystine	1603010	22523	40	20160406*
Euro OTC	Cystine	1610013	22863	40	20161110*
Euro OTC	Cystine	1801016	23879	40	20180126*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 200 spectra of 5 reference samples from the substance/substance group *Cystine*. These samples are listed above in the section *calibration samples*. The reference samples originate from 5 different batches.

- 72 233 spectra from a total of 1577 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 100 spectra from 3 reference samples of the substance/substance group *Cystine*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Cystine	1104017-01	20515	40
Euro OTC	Cystine	1408016-01	21715†	20
Fagron	Cystine	15F08-B05-310685	23767	40

- 161 973 spectra from a total of 3496 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B*

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 9 spectra from 3 *Apo-Ident* customers from 6 batches from the substance/substance group *Cystine*.

- These include spectra of independent samples from 6 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Euro OTC	Cystine	2081301	1
Euro OTC	Cystine	3021502	1
Euro OTC	Cystine	1204090	1
Euro OTC	Cystine	1207013-01	3
Fagron	Cystine	12D26-B04-285823	2
Euro OTC	Cystine	26081408	1

- 77 150 spectra from 463 *Apo-Ident* customers from a total of 25 541 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Cystine* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Cystine* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	200	0	72 233
Type B	0	100	0	161 973
Type C	0	9	0	77 150

The substance/substance group *Cystine* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 94.0000 %)
Type C	100.0000 % (> 99.8851 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21328	23879	3.91	38.32
21715	23879	4.70	40.38
22523	22523	0.00	42.36
22863	22863	0.00	43.67
23879	23879	0.00	43.00

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Dapsone**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	22489-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Dapsone; Dapsonum

Special notes

When selecting the *Dapsone* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Dapsone*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Dapsone	160735	22489	40	20160405*
Caelo	Dapsone	170311	23301	39	20170221*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 79 spectra of 2 reference samples from the substance/substance group *Dapsone*. These samples are listed above in the section *calibration samples*. The reference samples originate from 2 different batches.

- 72 354 spectra from a total of 1580 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 100 spectra from 3 reference samples of the substance/substance group *Dapsone*.

- These include spectra of independent samples from 1 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Dapsone	160735	22489†	20
Caelo	Dapsone	16073502	22577	40
Caelo	Dapsone	16073502	22736	40

- 161 973 spectra from a total of 3497 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 0 spectra from 0 *Apo-Ident* customers from 0 batches from the substance/substance group *Dapsone*.

- These include spectra of independent samples from 0 batches, of which no spectra have been used for the generation of the database.

- 77 159 spectra from 463 *Apo-Ident* customers from a total of 25 547 batches from a further 701 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Dapsone* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Dapsone* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	79	0	72 354
Type B	0	100	0	161 973
Type C	0	0	0	77 159

The substance/substance group *Dapsone* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.4051 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 94.0000 %)
Type C	100.0000 % (> 99.8849 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
22489	22489	0.00	101.95
23301	23301	0.00	94.34

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Dequalinium chloride**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20350-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Dequalinium chloride; Dequalinii chloridum; Dequalinium chloratum

Special notes

When selecting the *Dequalinium chloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Dequalinium chloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Dequalinium chlo…	13I26-N10	21269	40	20130121
Caelo	Dequalinium chlo…	12361908	21296	40	1412076
Caelo	Dequalinium chlo…	12361906	21387	40	20121228
Euro OTC	Dequalinium chlo…	1405012-01	21617	40	20140623
Euro OTC	Dequalinium chlo…	1512032	22295	40	20160121*

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Dequalinium chlo…	15218406	22953	40	20150622
Caelo	Dequalinium chlo…	15402803	23121	40	1707614
Fagron	Dequalinium chlo…	15B16-B04-332113	23266	40	20150226
Caelo	Dequalinium chlo…	154028	23362	40	20160219*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 360 spectra of 9 reference samples from the substance/substance group *Dequalinium chloride*. These samples are listed above in the section *calibration samples*. The reference samples originate from 9 different batches.

- 72 073 spectra from a total of 1573 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 865 spectra from 18 reference samples of the substance/substance group *Dequalinium chloride*.

- These include spectra of independent samples from 7 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Dequalinium chloride	09336412	20254	45
Caelo	Dequalinium chloride	1166204	20350	40
Caelo	Dequalinium chloride	11166203	20475	40
Fagron	Dequalinium chloride	11D29-N11	20660	80
Caelo	Dequalinium chloride	12077503	20716	40

continued on the next page

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Dequalinium chloride	12361906	21386	60
Caelo	Dequalinium chloride	12361906	21387†	80
Euro OTC	Dequalinium chloride	1405012-01	21617†	20
Euro OTC	Dequalinium chloride	1512032	22295†	20
Caelo	Dequalinium chloride	180794	24011	40
Euro OTC	Dequalinium chloride	1804009	24082	40
Caelo	Dequalinium chloride	12361906	21386SI	60
Caelo	Dequalinium chloride	12361906	21387SI	60
Euro OTC	Dequalinium chloride	1405012-01	21617SI	60
Euro OTC	Dequalinium chloride	1512032	22295SI	60
Caelo	Dequalinium chloride	15218406	22953SI	40
Fagron	Dequalinium chloride	15B16-B04-332113	23266SI	40
Caelo	Dequalinium chloride	154028	23362SI	40

- 161 208 spectra from a total of 3486 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 135 spectra from 96 *Apo-Ident* customers from 56 batches from the substance/substance group *Dequalinium chloride*.

- These include spectra of independent samples from 48 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Euro OTC	Dequalinium chloride	1210008-02	2
Fagron	Dequalinium chloride	12B14-N01	1
Caelo	Dequalinium chloride	13348805	2
Caelo	Dequalinium chloride	13A23-N02	1
Euro OTC	Dequalinium chloride	1405012-02	3
Euro OTC	Dequalinium chloride	1407029-02	4
Fagron	Dequalinium chloride	14C10-B03-292286	2
Euro OTC	Dequalinium chloride	1512032-01	7
Caelo	Dequalinium chloride	15218401	7
Lamotte/Spangroh	Dequalinium chloride	15218404	1
Caelo	Dequalinium chloride	215I-01325	1
Fag / Noweda	Dequalinium chloride	15B16-B04-321326	1
Caelo	Dequalinium chloride	12077510	8
LEBSA/Phoenix	Dequalinium chloride	1210008-03	1
Caelo	Dequalinium chloride	1210008-03	1
S.Binder	Dequalinium chloride	1210008-04	1
Euro OTC	Dequalinium chloride	121000803	1
Euro OTC	Dequalinium chloride	1210008-04	1

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†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Supplier	Substance	Batch	Spectra
Caelo	Dequalinium chloride	12361906	3
Caelo	Dequalinium chloride	12361908	3
Caelo	Dequalinium chloride	12361911	3
Caelo	Dequalinium chloride	13/26-N10	1
Fagron	Dequalinium chloride	135070-0001	1
Fagron	Dequalinium chloride	13A23-N02	3
Fagron	Dequalinium chloride	13I26-N10	1
Fagron	Dequalinium chloride	13D26-N06	4
Raben-Apotheke Mildenau	Dequalinium chloride	1405012-01	1
Euro OTC	Dequalinium chloride	1405012-01	6
Lebsa/AHD	Dequalinium chloride	1405012-01	1
Caelo	Dequalinium chloride	1405012-02	1
Euro OTC	Dequalinium chloride	1407029-01	6
Fagron	Dequalinium chloride	1407029-01	2
Fagron	Dequalinium chloride	14C10-B03	1
Caelo	Dequalinium chloride	14C10-B03	1
Euro OTC	Dequalinium chloride	151203201	1
Allianz Healthcare	Dequalinium chloride	1512032-01	1
Phönix	Dequalinium chloride	151203201	1
Gehe	Dequalinium chloride	1512032-01	1
Caelo	Dequalinium chloride	15218402	1
Caelo	Dequalinium chloride	15218404	4
Caelo	Dequalinium chloride	15218406	1
Caelo	Dequalinium chloride	15218407	1
Caelo	Dequalinium chloride	15402803	1
Fagron	Dequalinium chloride	15B16-B04	1
Fagron	Dequalinium chloride	15B16B04304432	1
Fagron	Dequalinium chloride	15B16-B04-304432	1
Fagron	Dequalinium chloride	15B16-B04-326872	1
Fagron	Dequalinium chloride		1
Euro OTC	Dequalinium chloride	1210008-01	2
Caelo	Dequalinium chloride	5315I-01325	1
Caelo	Dequalinium chloride	3613A-01325	1
Phönix	Dequalinium chloride	10127-N02Retest	1
Euro OTC	Dequalinium chloride	1010022-01	2
Fagron	Dequalinium chloride	10H05-N07	1
EuRho	Dequalinium chloride	1110002-01	1
Euro OTC	Dequalinium chloride	1110002-01	3
Caelo	Dequalinium chloride	11166204	2
Caelo	Dequalinium chloride	11166203	1
Anzag ek:7.89EUR	Dequalinium chloride	11166204	1
Caelo	Dequalinium chloride	11166209	1
Caelo	Dequalinium chloride	12077508	3
Alliance Health	Dequalinium chloride	12077508	1
AHD, 24.09.2013	Dequalinium chloride	12077508	1
Euro OTC	Dequalinium chloride	1210008-03	2
Noweda	Dequalinium chloride	12b14-n05	1
Fagron	Dequalinium chloride	12B14-N05	1
Fagron	Dequalinium chloride	12D05-N09	1
Fagron	Dequalinium chloride	12G05-N07	2
Caelo	Dequalinium chloride	12G05-N07	1
Euro OTC	Dequalinium chloride	15061204	1
Caelo	Dequalinium chloride	220812K2	1
GEHE	Dequalinium chloride		1
Caelo	Dequalinium chloride		1
Euro OTC	Dequalinium chloride	1103045-01	1

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- 77 024 spectra from 463 *Apo-Ident* customers from a total of 25 491 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Dequalinium chloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Dequalinium chloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	360	0	72 073
Type B	0	604	261	161 208
Type C	0	94	41	77 024

The substance/substance group *Dequalinium chloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9887 %)	100.0000 % (> 98.3333 %)
Type B	100.0000 % (> 99.9928 %)	69.8266 % (> 69.4798 %)
Type C	100.0000 % (> 99.8850 %)	69.6296 % (> 67.4074 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21269	21296	24.35	42.34
21296	21296	0.00	33.35
21387	21296	9.40	43.43
21617	21296	9.06	43.91
22295	22295	0.00	43.92
22953	21296	19.10	40.09
23121	23121	0.00	55.99
23266	21296	14.49	48.38
23362	23362	0.00	45.41

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Dexamethasone**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20009-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Dexamethasone; Dexamethasonum

Special notes

When selecting the *Dexamethasone* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Dexamethasone*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Dexamethasone	1303007-01	21289	40	1407432
Caelo	Dexamethasone	13084315	21403	40	AR-15-FG-006810-01
Euro OTC	Dexamethasone	1601052	22364	30	20160225*
Euro OTC	Dexamethasone	1611001	22914	40	20161212*
Fagron	Dexamethasone	16F02-B05-324844	23168	40	20160711
Euro OTC	Dexamethasone	1601052	22364SI	30	20160225*
Euro OTC	Dexamethasone	1611001	22914SI	37	20161212*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 257 spectra of 7 reference samples from the substance/substance group *Dexamethasone*. These samples are listed above in the section *calibration samples*. The reference samples originate from 5 different batches.

- 72 176 spectra from a total of 1577 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 610 spectra from 18 reference samples of the substance/substance group *Dexamethasone*.

- These include spectra of independent samples from 8 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Dexamethasone	81002179	20009	30
Euro OTC	Dexamethasone	1012005-01	20188	45
Caelo	Dexamethasone	13084306	21062	40
Euro OTC	Dexamethasone	1209008-02	21078	40
Caelo	Dexamethasone	13084315	21403†	20
Euro OTC	Dexamethasone	1303007-01	21850	60
Euro OTC	Dexamethasone	1601052	22364†	15
Caelo	Dexamethasone	15054627	23169	40
Caelo	Dexamethasone	171042	23331	40
Euro OTC	Dexamethasone	1708004	23692	40
Caelo	Dexamethasone	172856	23841	40
Euro OTC	Dexamethasone	1303007-01	21850SI	45

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*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Dexamethasone	1601052	22364SI†	15
Fagron	Dexamethasone	16F02-B05-324844	23168SI	30
Caelo	Dexamethasone	15054627	23169SI	20
Caelo	Dexamethasone	171042	23331SI	24
Euro OTC	Dexamethasone	1708004	23692SI	26
Caelo	Dexamethasone	172856	23841SI	40

- 161 463 spectra from a total of 3487 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 564 spectra from 224 *Apo-Ident* customers from 151 batches from the substance/substance group *Dexamethasone*.

- These include spectra of independent samples from 149 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Phoenix Goettin	Dexamethasone	117113352302	1
Euro OTC	Dexamethasone	10369920	2
Caelo	Dexamethasone		1
Caelo	Dexamethasone	10369921	2
Fagron	Dexamethasone	11D26-N10	4
Caelo	Dexamethasone	11D26-N10	1
Fagron	Dexamethasone	11L08-N01	4
Caelo	Dexamethasone	12033301	4
Caelo	Dexamethasone	12033315	4
Euro OTC	Dexamethasone	1209008-01	11
Euro OTC	Dexamethasone	1209008-02	29
Euro OTC	Dexamethasone	120900802	2
Euro OTC	Dexamethasone	120908-01	1
Fagron	Dexamethasone	12B06-N12	6
unbekannt	Dexamethasone	12D26-N09	1
Euro OTC	Dexamethasone	13030007	1
Euro OTC	Dexamethasone	13030007-01	1
Euro OTC	Dexamethasone	1303007	1
Raben-Apotheke Mildenau	Dexamethasone	1303007-01	2
Euro OTC	Dexamethasone	1303007-01	31
Euro OTC	Dexamethasone	130300701	4
Symbiotica	Dexamethasone	1303007-01	1
EuRho	Dexamethasone	1303007-01	1
Euro OTC	Dexamethasone	130300702	2
Euro OTC	Dexamethasone	1303007-02	7

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†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Supplier	Substance	Batch	Spectra
Euro OTC	Dexamethasone	1303007-03	23
Caelo	Dexamethasone	1303007-03	1
Noweda	Dexamethasone	1303007-03	1
EuRho / Phoenix	Dexamethasone	1303007-03	1
Henry Lamotte Oils GmbH	Dexamethasone	13084304	1
Caelo	Dexamethasone	13084306	4
GEHE 12.03.2014	Dexamethasone	13084306	1
Caelo	Dexamethasone	13084307	3
Fagron	Dexamethasone	13084308	1
Sanacorp	Dexamethasone	13084308	1
Caelo	Dexamethasone	13084309	1
Caelo	Dexamethasone	13084308	2
Caelo	Dexamethasone	13084310	7
Gehe 8.04.2014	Dexamethasone	13084310	2
Phoenix	Dexamethasone	13084313	2
Caelo	Dexamethasone	13084313	3
Caelo	Dexamethasone	13084316	2
Caelo	Dexamethasone	13084317	7
Gehe	Dexamethasone	13084317	1
Caelo	Dexamethasone	13084319	2
Caelo	Dexamethasone	13084320	3
Caelo	Dexamethasone	1335213	1
Caelo	Dexamethasone	13352302	7
Caelo	Dexamethasone	13352304	1
Caelo	Dexamethasone	13352308	7
Caelo	Dexamethasone	13352309	1
Berkel AHK	Dexamethasone	13352309	1
Sanacorp	Dexamethasone	13352309	1
Euro OTC	Dexamethasone	13352309	1
Caelo	Dexamethasone	13352310	10
Phönix Gotha	Dexamethasone	13352311	1
Caelo	Dexamethasone	13352311	1
Caelo	Dexamethasone	13352312	12
Fagron	Dexamethasone	13D12-N19	1
Caelo	Dexamethasone	13G08-N13	2
Fagron	Dexamethasone	13G08-N13	5
Phoenix	Dexamethasone	13g08n13	1
Fagron	Dexamethasone	13L30-B34-289691	1
Caelo	Dexamethasone	14196402	4
Fagron	Dexamethasone	14A22-B03	2
Fagron	Dexamethasone	14A22-B03-290700	1
Fagron	Dexamethasone	14A22-B03-290701	1
Fagron	Dexamethasone	14A22-B03-294030	1
Fagron	Dexamethasone	14D11-B01	1
Euro OTC	Dexamethasone	14D11-B01-294031	1
Fagron	Dexamethasone	14D11-B01-294032	1
Caelo	Dexamethasone	1504610	1
Caleo	Dexamethasone	15054602	2
Caelo	Dexamethasone	15054602	5
Gehe	Dexamethasone	15054602	2
Caelo	Dexamethasone	15054603	2
Fagron	Dexamethasone	15054603	1
Caelo	Dexamethasone	15054605	5
Caelo	Dexamethasone	15054606	9
Sanofi-Chimie FR/Noweda	Dexamethasone	15054606	2
Caesar&Loretz GmbH,Phön...	Dexamethasone	15054606	2
Caelo	Dexamethasone	15054609	4
Caelo	Dexamethasone	15054610	1
PH Euro 8,0	Dexamethasone	15054610	1
Caelo	Dexamethasone	15054611	5

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Supplier	Substance	Batch	Spectra
Caelo	Dexamethasone	15054617	6
Fagron	Dexamethasone	15054614	1
caesar	Dexamethasone	15054617	1
Caelo	Dexamethasone	15054618	2
Caelo	Dexamethasone	15054621	4
Euro OTC	Dexamethasone	15054621	1
Gehe	Dexamethasone	15054621	1
Caelo	Dexamethasone	15054622	15
caesar&loretz GmbH,Phön...	Dexamethasone	15054622	3
Caelo	Dexamethasone	15054623	3
Caelo	Dexamethasone	15054627	2
Caelo	Dexamethasone	15054628	6
Gehe	Dexamethasone	15054629	1
Caelo	Dexamethasone	15054629	3
Caelo	Dexamethasone	15054631	1
EuRho / Phoenix	Dexamethasone	15054631	1
Caelo	Dexamethasone	15215601	1
Fagron	Dexamethasone	15A05-B01	1
Fagron	Dexamethasone	15A05-B01-034636	1
Fagron	Dexamethasone	15A05-B01-304636	2
Fagron	Dexamethasone	15a05-b01-304636	1
Caelo	Dexamethasone	15A05-B01-304637	1
Fagron	Dexamethasone	15A05-B01-304637	1
Fagron	Dexamethasone	15C16-B07	1
Fagron	Dexamethasone	15C16-B07-308252	2
Fagron	Dexamethasone	15I04-B04-315528	1
Phoenix	Dexamethasone	15I04-B04	1
PHÖNIX	Dexamethasone	15K17-B07	1
Fagron	Dexamethasone	15K17-B07-321457	1
Fagron	Dexamethasone	15K17-B07	1
Euro OTC	Dexamethasone	1601052-01	16
Euro OTC	Dexamethasone	160105201	1
Sanacorp	Dexamethasone	1601052-01	1
Euro OTC	Dexamethasone	1601052-02	12
Symbiotica/Noweda	Dexamethasone	1601052-02	1
EuRho Anzag	Dexamethasone	1601052-02	1
Caelo	Dexamethasone	1601052-02	1
Noweda/Apomix	Dexamethasone	1611001-01	1
Euro OTC	Dexamethasone	161100101	2
Euro OTC	Dexamethasone	1611001-01	10
Ebert-Jacobi	Dexamethasone	1611001-01	1
Fagron	Dexamethasone	16F01-B05	1
Fagron	Dexamethasone	16I06-B03-327488	2
Caelo	Dexamethasone	1704203	1
Euro OTC	Dexamethasone	1708004-01	1
Caelo	Dexamethasone	17081716	1
Fagron	Dexamethasone	17104203	1
Caelo	Dexamethasone	17104211	1
Caelo	Dexamethasone	17332404	1
Fagron	Dexamethasone	17C13-B07-332461	1
Fagron	Dexamethasone	17E31-B01-338016	1
Fagron	Dexamethasone	2314A-01327	1
Fagron	Dexamethasone	700107-0002	1
Euro OTC	Dexamethasone	alt2412A-01327	1
Euro OTC	Dexamethasone	DB003/0213	3
Fagron	Dexamethasone	7H21N03	1
Caelo	Dexamethasone	90939399	1
Phönix Gotha	Dexamethasone	9383629	1
Fagron	Dexamethasone	9383631	1
Caelo	Dexamethasone	9383631	1

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Supplier	Substance	Batch	Spectra
Caelo	Dexamethasone	10369917	1
Caelo	Dexamethasone	10369919	1
Phönix Gotha	Dexamethasone	10369919	1
Caelo	Dexamethasone	10369920	6
ANZAG am 29.05.2012	Dexamethasone	10369920	1
Gehe	Dexamethasone	10369920	1
Caesar & Loretz GmbH, 4...	Dexamethasone	10369922	1
Phoenix	Dexamethasone	10369928	1
Euro OTC	Dexamethasone	1107006-01	1
Euro OTC	Dexamethasone	110700601	1
Noweda	Dexamethasone	1107006-02	1
Euro OTC	Dexamethasone	1111055-01	6
Noweda	Dexamethasone	1111055-01	2
Euro OTC	Dexamethasone	111105501	1
Euro OTC	Dexamethasone	1111055-02	3
Fagron	Dexamethasone	11F30-N02	1
Euro OTC	Dexamethasone	12030320	1
Euro OTC	Dexamethasone	1203032-01	6
Phönix	Dexamethasone	120303201	1
Anzag	Dexamethasone	1203032-01	1
Fagron	Dexamethasone	1203032-02	1
Euro OTC	Dexamethasone	1203032-02	4
Caelo	Dexamethasone	12033304	1
Caelo	Dexamethasone	12033305	4
Anzag 18.06.2013	Dexamethasone	12033305	1
Phönix	Dexamethasone	12033306	1
Caelo	Dexamethasone	12033306	1
Caelo	Dexamethasone	12033307	6
Sanofi-Chimie, FR/ Noweda	Dexamethasone	12033308	1
Caelo	Dexamethasone	12033308	2
Caelo	Dexamethasone	12033312	2
Caelo	Dexamethasone	12033314	7
gehe 30.09.13	Dexamethasone	12033314	2
Phönix	Dexamethasone	12033314	1
Phönix Gotha	Dexamethasone	12033315	1
GEHE	Dexamethasone	12033317	1
Caelo	Dexamethasone	12033317	5
Caelo	Dexamethasone	12033318	5
Gehe	Dexamethasone	12033318	1
Euro OTC	Dexamethasone	1209006-02	1
Euro OTC	Dexamethasone	1209008	1
Fagron	Dexamethasone	1209008-01	1
Pharmacia&Upjohn Comp	Dexamethasone	1209008-02	1
Gehe	Dexamethasone	120900802	1
Caelo	Dexamethasone	12091306	1
Caelo	Dexamethasone	12165803	1
Phönix 10.01.2013	Dexamethasone	12165803	1
Caelo	Dexamethasone	12165804	2
Anzag	Dexamethasone	1233305	1
Fagron	Dexamethasone	12D26-N09	2
Fagron	Dexamethasone	12D26-NH09	1
Fagron	Dexamethasone	12H21-N11	4
Caelo	Dexamethasone	13084304	2
Caelo	Dexamethasone	13084305	4
Caelo	Dexamethasone	13084314	1
Caelo	Dexamethasone	130854306	1
Fagron	Dexamethasone	13D12-N09	5
Caelo	Dexamethasone	13D12-N09	1
Euro OTC	Dexamethasone	1512211327	1
Caelo	Dexamethasone	3084310	1

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Supplier	Substance	Batch	Spectra
Euro OTC	Dexamethasone	2803211327	1
Euro OTC	Dexamethasone	5213A1327	1
Caelo	Dexamethasone	72134487	1
Euro OTC	Dexamethasone		1
Caelo	Dexamethasone	DM-MIC10005K	1
Fagron	Dexamethasone	DZ11005K12B06-N12	1
Euro OTC	Dexamethasone	DZ11005K	1
Gehe	Dexamethasone	1203032-02	1

- 76 595 spectra from 463 *Apo-Ident* customers from a total of 25 397 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Dexamethasone* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Dexamethasone* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	257	0	72 176
Type B	0	599	11	161 463
Type C	0	557	7	76 595

The substance/substance group *Dexamethasone* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.6654 %)
Type B	100.0000 % (> 99.9928 %)	98.1967 % (> 97.7049 %)
Type C	100.0000 % (> 99.8849 %)	98.7589 % (> 98.2270 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21289	21289	0.00	48.02
21403	21403	0.00	11.21
22364	22364	0.00	10.12
22914	22914	0.00	10.03
23168	21289	7.45	50.11

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Dexamethasone acetate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20313-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Dexamethasone acetate; Dexamethasoni acetas; Dexamethasonum aceticum

Special notes

When selecting the *Dexamethasone acetate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Dexamethasone acetate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Dexamethasone ac…	13260703	21301	40	1412430
Caelo	Dexamethasone ac…	13260706	21593	40	1502537
Euro OTC	Dexamethasone ac…	1405024-01	21614	40	20140620
Caelo	Dexamethasone ac…	14200207	21815	40	20140807
Euro OTC	Dexamethasone ac…	1405024-01	21614SI	30	20140620
Caelo	Dexamethasone ac…	14200207	21815SI	30	20140807

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 220 spectra of 6 reference samples from the substance/substance group *Dexamethasone acetate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 4 different batches.

- 72 213 spectra from a total of 1578 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 336 spectra from 11 reference samples of the substance/substance group *Dexamethasone acetate*.

- These include spectra of independent samples from 4 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Dexamethasone acetate	11093210	20313	40
Caelo	Dexamethasone acetate	10145912	20325	40
Caelo	Dexamethasone acetate	13260706	21593†	20
Euro OTC	Dexamethasone acetate	1405024-01	21614†	20
Caelo	Dexamethasone acetate	14200207	21815†	20
Caelo	Dexamethasone acetate	161066	22437	60
Euro OTC	Dexamethasone acetate	1708011	23693	40
Euro OTC	Dexamethasone acetate	1405024-01	21614SI†	15
Caelo	Dexamethasone acetate	14200207	21815SI†	15
Caelo	Dexamethasone acetate	161066	22437SI	42
Euro OTC	Dexamethasone acetate	1708011	23693SI	24

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 737 spectra from a total of 3492 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 116 spectra from 53 *Apo-Ident* customers from 52 batches from the substance/substance group *Dexamethasone acetate*.

- These include spectra of independent samples from 48 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Dexamethasone acetate	1110007	1
Euro OTC	Dexamethasone acetate	1110007-01	2
Euro OTC	Dexamethasone acetate	1110007-02	6
Noweda	Dexamethasone acetate	1110007-02	1
Euro OTC	Dexamethasone acetate	1110007-03	1
Caelo	Dexamethasone acetate	13100404	3
Caelo	Dexamethasone acetate	13100408	1
Caelo	Dexamethasone acetate	13100407	4
Caelo	Dexamethasone acetate	13260701	4
Caelo	Dexamethasone acetate	13260702	1
Caelo	Dexamethasone acetate	13260703	3
Caelo	Dexamethasone acetate	13260705	2
Caelo	Dexamethasone acetate	1405024-01	1
Euro OTC	Dexamethasone acetate	1405024-01	1
Euro OTC	Dexamethasone acetate	1405024-02	6
Euro OTC	Dexamethasone acetate	140502402	1
Euro OTC	Dexamethasone acetate	1405024-03	11
Caelo	Dexamethasone acetate	140502403	1
Apomix/AHD	Dexamethasone acetate	1405024-03	1
Euro OTC	Dexamethasone acetate	1405024-04	3
Caelo	Dexamethasone acetate	14200201	3
Caelo	Dexamethasone acetate	14200205	2
Caelo	Dexamethasone acetate	14200207	1
Caelo	Dexamethasone acetate	14200208	2
Caelo	Dexamethasone acetate	14379602	2
Caelo	Dexamethasone acetate	14379607	2
Caelo	Dexamethasone acetate	14379609	3
Caelo	Dexamethasone acetate	14379611	1
Caelo	Dexamethasone acetate	14379615	3
Caelo	Dexamethasone acetate	14379616	2
Caelo	Dexamethasone acetate	15243201	1
Caelo	Dexamethasone acetate	15243202	3
Caelo	Dexamethasone acetate	16106602	1
Caelo	Dexamethasone acetate	16106604	1
Caelo	Dexamethasone acetate	16106608	1
Caelo	Dexamethasone acetate	16106603	1
Caelo	Dexamethasone acetate	16106610	1
Caelo	Dexamethasone acetate	16106613	1
Caelo	Dexamethasone acetate		1
Caelo	Dexamethasone acetate	11093210	1

continued on the next page

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Supplier	Substance	Batch	Spectra
Caelo	Dexamethasone acetate	11093211	1
Caelo	Dexamethasone acetate	11093215	1
Caelo	Dexamethasone acetate	12021801	4
EuRho	Dexamethasone acetate	1110007-01	1
Fagron	Dexamethasone acetate	1110007-01	1
Caelo	Dexamethasone acetate	12021803	3
VDL	Dexamethasone acetate	12021803	1
GEHE	Dexamethasone acetate	12021805	1
Caelo	Dexamethasone acetate	12021814	2
Caelo	Dexamethasone acetate	13100401	1
Caelo	Dexamethasone acetate	13100403	4
Caelo	Dexamethasone acetate	13100406	1
Noweda	Dexamethasone acetate	13100406	1
Phönix	Dexamethasone acetate		1
Caelo	Dexamethasone acetate	22/AKD2	1
Caelo	Dexamethasone acetate	3913Q-01326	1
Caelo	Dexamethasone acetate	4113I-01326	1
Caelo	Dexamethasone acetate	5/AD1	1
Caelo	Dexamethasone acetate	12021811	1
europharma	Dexamethasone acetate	1110007-01	1

- 77 043 spectra from 463 *Apo-Ident* customers from a total of 25 496 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Dexamethasone acetate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Dexamethasone acetate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	220	0	72 213
Type B	0	336	0	161 737
Type C	0	115	1	77 043

The substance/substance group *Dexamethasone acetate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.2727 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 98.2143 %)
Type C	100.0000 % (> 99.8850 %)	99.1379 % (> 96.5517 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to

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exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21301	21301	0.00	31.19
21593	21593	0.00	36.31
21614	21301	6.41	36.15
21815	21593	9.11	35.45

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Dextromethorphan hydrobromide monohydrate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	22318-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Dextromethorphan hydrobromide monohydrate; Dextromethorphani hydrobromidum

Special notes

When selecting the *Dextromethorphan hydrobromide monohydrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Dextromethorphan hydrobromide monohydrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Dextromethorphan…	15D23-B07-308849	22318	40	AR-16-FG-008487-02
Fagron	Dextromethorphan…	16A22-B03-321371	23103	40	20160205
Fagron	Dextromethorphan…	17B28-B01-341594	23780	40	20170612

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Dextromethorphan - hydrobromide monohydrate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 132 spectra from 5 reference samples of the substance/substance group *Dextromethorphan hydrobromide monohydrate*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Dextromethorphan hydrobromid…	15D23-B07-308849	22318†	20
Fagron	Dextromethorphan hydrobromid…	15D23-B07-308849	22326	60
Fagron	Dextromethorphan hydrobromid…	16E23-B02-329706	23593	40
Fagron	Dextromethorphan hydrobromid…	14H27-B04-299502	not required	7
Fagron	Dextromethorphan hydrobromid…	16A22-B03-321371	not required	5

- 161 941 spectra from a total of 3496 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 1 spectra from 1 *Apo-Ident* customers from 1 batches from the substance/substance group *Dextromethorphan hydrobromide monohydrate*.

- These include spectra of independent samples from 1 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Dextromethorphan hydrobromid…	16A22-B03-319331	1

- 77 158 spectra from 463 *Apo-Ident* customers from a total of 25 546 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Dextromethorphan hydrobromide monohydrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Dextromethorphan hydrobromide monohydrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	132	0	161 941
Type C	0	1	0	77 158

The substance/substance group *Dextromethorphan hydrobromide monohydrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 95.4545 %)
Type C	100.0000 % (> 99.8862 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
22318	22318	0.00	44.91
23103	22318	3.13	44.63
23780	22318	4.79	44.51

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**D-galactose**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20326-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

D-galactose; D-Galactopyranose; Galactosum

Special notes

When selecting the D-*galactose* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group D-*galactose*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Falcento	D-galactose	007223PF3	20894	40	20130128
Fagron	D-galactose	13I13-B40-287993	21762	40	AR-15-FG-008936-01
Fagron	D-galactose	14H05-B09-310972	22259	40	20140818

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group D-*galactose*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 230 spectra from 7 reference samples of the substance/substance group D-*galactose*.

- These include spectra of independent samples from 4 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
inalc	D-galactose	00372PF1	20259	30
Kaden Biochemicals	D-galactose	013	20326	40
Fagron	D-galactose	11F30-N08	20839	40
Fagron	D-galactose	13I13-B40-287993	21762†	20
Fagron	D-galactose	14H05-B09-310972	22259†	20
Fagron	D-galactose	15G13-B04-320810	23106	40
Fagron	D-galactose	15G13-B04-320810	23595	40

- 161 843 spectra from a total of 3493 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 31 spectra from 5 *Apo-Ident* customers from 21 batches from the substance/substance group D-*galactose*.

- These include spectra of independent samples from 20 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Phönix	D-galactose	12223PF4	2
inalco	D-galactose	212619PF5	1
Falcento	D-galactose	1223PF4	3
Falcento	D-galactose	2223PF4	3
Falcento	D-galactose	122PF4	1
Falcento	D-galactose	222PF4	1
Falcento	D-galactose	5223PF4	3
Falcento	D-galactose	13223PF4	1
Phönix	D-galactose	39223PF3	2
Falcento	D-galactose	2014	1
Falcento	D-galactose	48223PF2	1
Falcento	D-galactose	10440003	2
Denk	D-galactose	10440003	1
Phönix 04.03.2014	D-galactose		1
falcento	D-galactose	322619PF5	1
Fagron	D-galactose	16G22-B01-329906	1
Fagron	D-galactose	10E06-N01	1
Fagron	D-galactose	11L19-N07	1
Fagron	D-galactose	12B09-N02	1
Ruth	D-galactose	142185443	1
Denk	D-galactose		1
AppliChem	D-galactose	2K003859	1

- 77 128 spectra from 463 *Apo-Ident* customers from a total of 25 527 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group D-*galactose* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with D-*galactose* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	181	49	161 843
Type C	0	29	2	77 128

The substance/substance group D-*galactose* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	78.6957 % (> 77.3913 %)
Type C	100.0000 % (> 99.8850 %)	93.5484 % (> 83.8710 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20894	21762	11.99	49.04
21762	21762	0.00	47.90
22259	21762	5.04	48.65

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Diclofenac sodium**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20022-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Diclofenac sodium; Diclofenacum natricum; Natrii diclofenaci

Special notes

When selecting the *Diclofenac sodium* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Diclofenac sodium*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Diclofenac sodium	12214219	20883	29	20120815
Fagron	Diclofenac sodium	13E03-N02	20886	40	20130515
Fagron	Diclofenac sodium	12L28-B05	21261	40	20130123
Caelo	Diclofenac sodium	13214311	21467	40	20130826
Caelo	Diclofenac sodium	13214311	21470	40	20130826
Euro OTC	Diclofenac sodium	1607016	22694	40	20160808*
Caelo	Diclofenac sodium	163492	23037	40	20170112*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 269 spectra of 7 reference samples from the substance/substance group *Diclofenac sodium*. These samples are listed above in the section *calibration samples*. The reference samples originate from 6 different batches.

- 72 164 spectra from a total of 1576 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 210 spectra from 6 reference samples of the substance/substance group *Diclofenac sodium*.

- These include spectra of independent samples from 4 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Diclofenac sodium	80110508	20022	30
Euro OTC	Diclofenac sodium	1403013-01	21330	40
Caelo	Diclofenac sodium	13214311	21467†	20
Caelo	Diclofenac sodium	13214311	21470†	20
Fagron	Diclofenac sodium	15D14-B04-307452	21979	60
Euro OTC	Diclofenac sodium	1711026	23872	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 863 spectra from a total of 3494 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 163 spectra from 80 *Apo-Ident* customers from 64 batches from the substance/substance group *Diclofenac sodium*.

- These include spectra of independent samples from 60 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Diclofenac sodium	5041401	1
Caelo	Diclofenac sodium	5081501	1
Fagron	Diclofenac sodium	10031505	1
Euro OTC	Diclofenac sodium	11091404	1
Euro OTC	Diclofenac sodium	111104001	1
Caelo	Diclofenac sodium	12214202	1
Euro OTC	Diclofenac sodium	12214220	1
Caelo	Diclofenac sodium	12L28-B05	1
Fagron	Diclofenac sodium	12L28-B05-289773	2
Caelo	Diclofenac sodium	13214304	1
Caelo	Diclofenac sodium	13214308	3
Caelo	Diclofenac sodium	13214309	3
Caelo	Diclofenac sodium	13214311	8
Fischar/Phönix	Diclofenac sodium	13214311	1
Caelo	Diclofenac sodium	13214312	2
Caelo	Diclofenac sodium	13214316	1
Caelo	Diclofenac sodium	13214317	5
Caelo	Diclofenac sodium	13214318	5
Euro OTC	Diclofenac sodium	1403013-01	5
Caelo	Diclofenac sodium	13H22-N10	1
Euro OTC	Diclofenac sodium	140301301	1
Noweda	Diclofenac sodium	1403013-01	1
Euro OTC	Diclofenac sodium	1403013-02	8
EurRho/ Anzag	Diclofenac sodium	1403013-03	1
Euro OTC	Diclofenac sodium	1403013-03	3
Phönix	Diclofenac sodium	1403013-03	1
Fagron	Diclofenac sodium	14031411	1
Fargron	Diclofenac sodium	14G17-B08-297032	1
Fagron	Diclofenac sodium	14G17-B08-297032	5
Caelo	Diclofenac sodium	1503014-01	1
Euro OTC	Diclofenac sodium	1503014-01	14
Euro OTC	Diclofenac sodium	1503014-02	3
Caelo	Diclofenac sodium	15169604	6
Caelo	Diclofenac sodium	15169613	1
Caelo	Diclofenac sodium	15169616	1
Caelo	Diclofenac sodium	15169617	1
Gehe	Diclofenac sodium	15278502	1
Caelo	Diclofenac sodium	15278502	1
Fagron	Diclofenac sodium	15D14-B04	1
Fagron	Diclofenac sodium	15D14-B04-314450	1
AHD	Diclofenac sodium	15D14B04314450	1

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Supplier	Substance	Batch	Spectra
Fagron	Diclofenac sodium		1
Fagron	Diclofenac sodium	15K23-B03	1
Fagron	Diclofenac sodium	15K23-B03-318519	1
Phoenix	Diclofenac sodium	15K23-B03	1
Caelo	Diclofenac sodium	15K23-B03-318519	1
Fagron	Diclofenac sodium	15K23-B03-321673	2
Fagron	Diclofenac sodium	15K23-B03-324025	3
Fagron	Diclofenac sodium	15K23-B03-325753	1
Fargon GmbH & Co.KG	Diclofenac sodium	15K23-B03-325753	1
Fagron	Diclofenac sodium	15K23-B03-327802	3
Caelo	Diclofenac sodium	15K23-BO3-325753	1
Euro OTC	Diclofenac sodium	1607016-01	6
Caelo	Diclofenac sodium	1607016-01	1
Euro OTC	Diclofenac sodium	1607016-02	2
Euro OTC	Diclofenac sodium	25041403	1
Sanacorp	Diclofenac sodium	3616Q-02994	1
Fagron	Diclofenac sodium	RDS/1405/0159A	1
Caelo	Diclofenac sodium	10335805	1
Caelo	Diclofenac sodium	11091201	1
Euro OTC	Diclofenac sodium	1111040-01	2
Noweda	Diclofenac sodium	11301804	1
Noweda	Diclofenac sodium	11G12-N06	1
Euro OTC	Diclofenac sodium	1206026	1
Gehe	Diclofenac sodium	1206026-01	2
Euro OTC	Diclofenac sodium	1206026-01	7
Sanacorp	Diclofenac sodium	1206026-01	1
Euro OTC	Diclofenac sodium	1206026-02	7
Caelo	Diclofenac sodium	12214205	1
Caelo	Diclofenac sodium	12214206	1
Caelo	Diclofenac sodium	12214219	3
Anzag Kassel 270812	Diclofenac sodium	12A10-N03	1
Fagron	Diclofenac sodium	12G02-N07	2
Euro OTC	Diclofenac sodium	13111203	1
Europharm/Otto	Diclofenac sodium	135796	1
Fagron	Diclofenac sodium	13E03-N02	1
Caelo	Diclofenac sodium	13214303	1

- 76 996 spectra from 463 *Apo-Ident* customers from a total of 25 483 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Diclofenac sodium* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Diclofenac sodium* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	269	0	72 164
Type B	0	210	0	161 863
Type C	0	162	1	76 996

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The substance/substance group *Diclofenac sodium* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.7695 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 97.1429 %)
Type C	100.0000 % (> 99.8850 %)	99.3865 % (> 97.5460 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20883	23037	5.94	58.98
20886	23037	7.12	58.28
21261	23037	6.60	59.81
21467	23037	6.17	56.91
21470	23037	7.63	57.96
22694	22694	0.00	62.92
23037	23037	0.00	56.56

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Diltiazem hydrochloride**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20043-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Diltiazem hydrochloride; Diltiazemi hydrochloridum; Diltiazemum hydrochloricum

Special notes

When selecting the *Diltiazem hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Diltiazem hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Diltiazem hydroc…	14C12-B04	21270	40	20140417
Caelo	Diltiazem hydroc…	13346914	21300	40	20131028
Caelo	Diltiazem hydroc…	161908	22631	40	20160715*
Fagron	Diltiazem hydroc…	16G20-B03-328133	23016	40	20160829

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 4 reference samples from the substance/substance group *Diltiazem hydrochloride*. These samples are listed above in the section *calibration samples*. The reference samples originate from 4 different batches.

- 72 273 spectra from a total of 1578 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 270 spectra from 6 reference samples of the substance/substance group *Diltiazem hydrochloride*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Diltiazem hydrochloride	91400279	20043	30
Caelo	Diltiazem hydrochloride	13346914	21406	60
Caelo	Diltiazem hydrochloride	13346914	21407	60
Fagron	Diltiazem hydrochloride	16G20-B03-328133	23015	40
Caelo	Diltiazem hydrochloride	170432	23325	40
Caelo	Diltiazem hydrochloride	173370	23826	40

- 161 803 spectra from a total of 3494 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 982 spectra from 285 *Apo-Ident* customers from 238 batches from the substance/substance group *Diltiazem hydrochloride*.

- These include spectra of independent samples from 234 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Diltiazem hydrochloride	1091503	1
Caelo	Diltiazem hydrochloride	10212421	1
Fagron	Diltiazem hydrochloride	11E18-N04	3
Caelo	Diltiazem hydrochloride	12/AKD12	1
Caelo	Diltiazem hydrochloride	12133014	2
Caelo	Diltiazem hydrochloride	12133022	14
Nachprüfung	Diltiazem hydrochloride		1
Fagron	Diltiazem hydrochloride	12D05-N07	18
Fagron	Diltiazem hydrochloride	12F19-N10	6
Phönix	Diltiazem hydrochloride	13196104	1
Caelo	Diltiazem hydrochloride	13031501	1
Phönix	Diltiazem hydrochloride	13196106	1
11.08.14 Phoenix	Diltiazem hydrochloride	13346901	1
Caelo	Diltiazem hydrochloride	13346901	9
Phoenix	Diltiazem hydrochloride	13346902	1
Caelo	Diltiazem hydrochloride	13346902	6
Caelo	Diltiazem hydrochloride	13346903	10
Caelo	Diltiazem hydrochloride	13346904	9
Caelo	Diltiazem hydrochloride	13346905	9
Caelo	Diltiazem hydrochloride	13346908	4
Caelo	Diltiazem hydrochloride	13346914	12
Fagron	Diltiazem hydrochloride	13346915	1
Anzag	Diltiazem hydrochloride	13346915	1
Caelo	Diltiazem hydrochloride	13346915	9
Caelo	Diltiazem hydrochloride	133469902	1
Fagron	Diltiazem hydrochloride	1359680007	1
Fagron	Diltiazem hydrochloride	135968-0009	2
Fagron	Diltiazem hydrochloride	13A02-N05	11
Fagron	Diltiazem hydrochloride	13G16-N05	26
Caelo	Diltiazem hydrochloride	13G16-N05	2
Kuerzel	Diltiazem hydrochloride	13G16-N05	1
Fagron	Diltiazem hydrochloride	13J24-B04	9
Caelo	Diltiazem hydrochloride	13J24-B04-286569	1
Fagron	Diltiazem hydrochloride	13J24-B04-286569	11
Fagron	Diltiazem hydrochloride	13J24B04286569	3
Fagron	Diltiazem hydrochloride	13J24-B04-286571	2
Fagron	Diltiazem hydrochloride	13J24-B04-289432	3
Caelo	Diltiazem hydrochloride	1405904	1
Caelo	Diltiazem hydrochloride	14059133	1
Caelo	Diltiazem hydrochloride	14059502	3
Caelo	Diltiazem hydrochloride	14059503	3
Fagron	Diltiazem hydrochloride	14059504	2
Caelo	Diltiazem hydrochloride	14059504	1

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Supplier	Substance	Batch	Spectra
Caelo	Diltiazem hydrochloride	14059513	18
Caelo	Diltiazem hydrochloride	14059514	14
Berkel AHK	Diltiazem hydrochloride	14059514	2
phönix	Diltiazem hydrochloride	14059514	1
Cealo/Sanacorp	Diltiazem hydrochloride	14059514	1
Caelo	Diltiazem hydrochloride	140595143	1
Caelo	Diltiazem hydrochloride	14059515	2
Caelo	Diltiazem hydrochloride	14059521	2
Caelo	Diltiazem hydrochloride	14318402	4
Sanacop	Diltiazem hydrochloride	14059523	1
Caelo	Diltiazem hydrochloride	14318403	5
Caelo	Diltiazem hydrochloride	14318409	14
Fagron	Diltiazem hydrochloride	14318409	1
Noweda	Diltiazem hydrochloride	14318409	1
Caelo	Diltiazem hydrochloride	14318410	4
Caelo	Diltiazem hydrochloride	14318412	15
phoenix	Diltiazem hydrochloride	14318412	1
Caesar&Loretz GmbH/Anzag	Diltiazem hydrochloride	14318412	1
Caelo	Diltiazem hydrochloride	14318413	3
Caelo	Diltiazem hydrochloride	14318414	3
Caelo	Diltiazem hydrochloride	14318416	3
Fagron	Diltiazem hydrochloride	14C12B04292757	1
Fagron	Diltiazem hydrochloride	14C12B04-294133	1
Caelo	Diltiazem hydrochloride	1459513	1
Fagron	Diltiazem hydrochloride	14C12-B04	11
Fagron	Diltiazem hydrochloride	14C12B04	1
Fagron	Diltiazem hydrochloride	14C12-B04-292757	22
AHD	Diltiazem hydrochloride	14C12-B04-292757	1
Gehe	Diltiazem hydrochloride	14C12-B04-292757	1
Sanacorp	Diltiazem hydrochloride	14c12-b04-292757	1
Fagron	Diltiazem hydrochloride	14C12-B04-292759	4
Fagron	Diltiazem hydrochloride	14c12-b04-292759	1
Apomix/Noweda	Diltiazem hydrochloride	14C12-B04-292759	1
Fagron	Diltiazem hydrochloride	14C12-B04-294133	7
Caelo	Diltiazem hydrochloride	14C12-B04-294133	1
Caelo	Diltiazem hydrochloride	14C12-B04-294135	1
Fagron	Diltiazem hydrochloride	14C12-B04-294134	2
Fagron	Diltiazem hydrochloride	14G22-B08	6
Fagron	Diltiazem hydrochloride	14G22B08	1
Fagron	Diltiazem hydrochloride	14G22-B08-299781	12
Fagron	Diltiazem hydrochloride	14G22-B08299781	2
Caelo	Diltiazem hydrochloride	14G22-B08-299781	1
sittig	Diltiazem hydrochloride	14G22-B08-299781	1
Caelo	Diltiazem hydrochloride	14g22b08299781	1
Fagron	Diltiazem hydrochloride	14G22-B08-299782	3
Fagron	Diltiazem hydrochloride	14G22-B08-299783	1
Caelo	Diltiazem hydrochloride	15/246/DI	1
Caelo	Diltiazem hydrochloride	15212801	10
Phönix	Diltiazem hydrochloride	15212801	1
Caelo	Diltiazem hydrochloride	15212802	7
Caelo	Diltiazem hydrochloride	15212806	2
Caelo	Diltiazem hydrochloride	1521806	1
Caelo	Diltiazem hydrochloride	15230000000000000000	1
Caelo	Diltiazem hydrochloride	15230501	6
Caelo	Diltiazem hydrochloride	15230502	11
Chiesi/Phoenix	Diltiazem hydrochloride	15230502	1
Caelo	Diltiazem hydrochloride	15230503	9
Phönix Gotha	Diltiazem hydrochloride	15230503	1
Noweda	Diltiazem hydrochloride	15230503	1
Phoenix	Diltiazem hydrochloride	15230503	1

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Supplier	Substance	Batch	Spectra
Caelo	Diltiazem hydrochloride	15230504	3
Caelo	Diltiazem hydrochloride	15230507	7
Caelo	Diltiazem hydrochloride	15230510	3
Caelo	Diltiazem hydrochloride	15230512	10
allianz	Diltiazem hydrochloride	15230512	1
Caelo	Diltiazem hydrochloride	15230513	1
Caelo	Diltiazem hydrochloride	15230514	2
Caelo	Diltiazem hydrochloride	15230515	1
Caelo	Diltiazem hydrochloride	15230516	1
Caelo	Diltiazem hydrochloride	15414301	13
Caelo	Diltiazem hydrochloride	15414302	12
Caesar&Loretz GmbH /Anzag	Diltiazem hydrochloride	15414302	1
Phönix	Diltiazem hydrochloride	15414302	1
Caelo	Diltiazem hydrochloride	15414304	2
Caelo	Diltiazem hydrochloride	15414305	2
Caelo	Diltiazem hydrochloride	15414309	4
Caelo	Diltiazem hydrochloride	15414310	1
Jenne	Diltiazem hydrochloride	15414313	1
Caelo	Diltiazem hydrochloride	15414313	7
Caelo	Diltiazem hydrochloride	15414314	2
Gehe	Diltiazem hydrochloride	15414319	1
Caelo	Diltiazem hydrochloride	15414319	9
anzag	Diltiazem hydrochloride	15414319	2
Caesar & Loretz GmbH Hi...	Diltiazem hydrochloride	15414319	1
Caelo	Diltiazem hydrochloride	15414320	1
Caelo	Diltiazem hydrochloride	15414321	2
Caelo	Diltiazem hydrochloride	15435807	1
Fagron	Diltiazem hydrochloride	15B12-B01	8
Fagron	Diltiazem hydrochloride	15B12-b01	1
Fagron	Diltiazem hydrochloride	15B12-B01305399	1
Fagron	Diltiazem hydrochloride	15B12-B01-305399	14
Fagron	Diltiazem hydrochloride	15B12B01305399	2
Fagron	Diltiazem hydrochloride	15b12-b01-305399	2
Caelo	Diltiazem hydrochloride	15B12-B01-305399	1
Fagron	Diltiazem hydrochloride	15B12-B01-305400	3
Fagron	Diltiazem hydrochloride	15B12B01305400	1
Fagron	Diltiazem hydrochloride	15B12-B01-305401	2
Fagron	Diltiazem hydrochloride	15G20-B08	2
Fagron	Diltiazem hydrochloride	15G20-B08-310792	2
Fagron	Diltiazem hydrochloride	15G20-B08-312065	8
Caelo	Diltiazem hydrochloride	15G20-B08-312065	2
Fagron	Diltiazem hydrochloride	15G20-B08-314375	9
Fagron	Diltiazem hydrochloride	15g20-b08-314375	1
Caelo	Diltiazem hydrochloride	15G20-B08-314375	1
Caelo	Diltiazem hydrochloride	16190805	3
Caelo	Diltiazem hydrochloride	16190801	1
Caesar & Loretz	Diltiazem hydrochloride	16190806	1
Caelo	Diltiazem hydrochloride	16190806	3
Caelo	Diltiazem hydrochloride	16190807	3
Caelo	Diltiazem hydrochloride	16190810	4
Caelo	Diltiazem hydrochloride	16190813	5
Gehe	Diltiazem hydrochloride	16190813	1
Caelo	Diltiazem hydrochloride	16190814	6
Caelo	Diltiazem hydrochloride	16190818	1
Fagron	Diltiazem hydrochloride	16A18-B07	7
Fagron	Diltiazem hydrochloride	16A14-B11-322153	1
Fagron	Diltiazem hydrochloride	16A18B07316667	1
Fagron	Diltiazem hydrochloride	16A18-B07-316667	6
Fagron	Diltiazem hydrochloride	16A18-B07-318732	10
Caelo	Diltiazem hydrochloride	16A18-B07-318732	1

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Supplier	Substance	Batch	Spectra
Fagron	Diltiazem hydrochloride	16a18-b07-318732	1
Fagron	Diltiazem hydrochloride	16A18-B07-318733	1
Caelo	Diltiazem hydrochloride	16A18-B07-319570	1
Fagron	Diltiazem hydrochloride	16C14-B11	4
Fagron	Diltiazem hydrochloride	16C14-B11-320568	2
Fagron	Diltiazem hydrochloride	16C14-B11-320849	7
Fagron	Diltiazem hydrochloride	16C14B11320849	1
Fagron	Diltiazem hydrochloride	16C14-B11-322152	2
Fagron	Diltiazem hydrochloride	16C14-B11-322153	2
Fagron	Diltiazem hydrochloride	16C14-B11-322642	10
Fagron	Diltiazem hydrochloride	16G20-B03	3
Hedinger GmbH	Diltiazem hydrochloride	16G20-B03	1
Fagron	Diltiazem hydrochloride	16G20B03325903	1
Fagron	Diltiazem hydrochloride	16G20-B03-325903	6
Fagron	Diltiazem hydrochloride	16G20-B03-328133	5
Caelo	Diltiazem hydrochloride	16G20-B03-328133	2
phönix	Diltiazem hydrochloride	16G20-B03-328133	1
Fagron	Diltiazem hydrochloride	16GH20-B03-325903	1
Fagron	Diltiazem hydrochloride	16L19-B01	2
Fagron	Diltiazem hydrochloride	16G20-B03-328253	1
Fagron	Diltiazem hydrochloride	16L19-B01-330365	3
Caelo	Diltiazem hydrochloride	17043202	4
Caelo	Diltiazem hydrochloride	17043203	3
Caelo	Diltiazem hydrochloride	17043204	2
Caelo	Diltiazem hydrochloride	17043205	3
Sanacorp	Diltiazem hydrochloride	17043205	1
Caelo	Diltiazem hydrochloride	17043207	1
Caelo	Diltiazem hydrochloride	17043215	2
Caelo	Diltiazem hydrochloride	17043216	3
Caelo	Diltiazem hydrochloride	17043218	1
Caelo	Diltiazem hydrochloride	17043224	1
Fagron	Diltiazem hydrochloride	17D11-B11-333704	6
Caelo	Diltiazem hydrochloride	17043228	1
Phönix	Diltiazem hydrochloride	17d11-b11-334837	1
Fagron	Diltiazem hydrochloride	17D11-B11-334837	2
Fagron	Diltiazem hydrochloride	17H25-B01-340697	1
Caelo	Diltiazem hydrochloride	18061511	1
Fagron	Diltiazem hydrochloride	22082014A	1
Caelo	Diltiazem hydrochloride	23121402	1
Caelo	Diltiazem hydrochloride	25041401	1
Fagron	Diltiazem hydrochloride	DIL/M-01314	1
Fagron	Diltiazem hydrochloride	DIL/M-0314	1
Fagron	Diltiazem hydrochloride	DIL/M-10515	1
Fagron	Diltiazem hydrochloride	DIL/M-13114	1
Caelo	Diltiazem hydrochloride	6031302	1
Fagron	Diltiazem hydrochloride	612213562	1
Caelo	Diltiazem hydrochloride	10069509	1
Fagron	Diltiazem hydrochloride	9J14-N17	2
Caelo	Diltiazem hydrochloride	10212404	3
Caelo	Diltiazem hydrochloride	10212413	1
Fagron	Diltiazem hydrochloride	10D28-N23	1
Caelo	Diltiazem hydrochloride	10212411	1
Fagron	Diltiazem hydrochloride	10808-N01	1
Fagron	Diltiazem hydrochloride	11/01-N08	1
Fiebig ek:12.27 01.08.12	Diltiazem hydrochloride	11/01-N08	1
phoenix	Diltiazem hydrochloride	11/01-N08	1
Caelo	Diltiazem hydrochloride	11091301	1
Fagron	Diltiazem hydrochloride	11-01-N08	1
Caelo	Diltiazem hydrochloride	11134103	1
Caelo	Diltiazem hydrochloride	11134113	1

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Supplier	Substance	Batch	Spectra
Caelo	Diltiazem hydrochloride	11134107	1
Sanacorp	Diltiazem hydrochloride	11134115	4
Gehe	Diltiazem hydrochloride	11134117	1
Caelo	Diltiazem hydrochloride	11134117	8
Caelo	Diltiazem hydrochloride	11134119	1
Fiebig 10.09.12 ek: 13,...	Diltiazem hydrochloride	11134119	1
Sanacorp	Diltiazem hydrochloride	11134121	2
Phönix 13.11.12	Diltiazem hydrochloride	11A17-N13	1
Fagron	Diltiazem hydrochloride	11I01-N08	2
Sanacorp	Diltiazem hydrochloride	11J28-04511	1
Fagron	Diltiazem hydrochloride	11J28-N05	3
Fagron	Diltiazem hydrochloride	11l012-N08	1
Caelo	Diltiazem hydrochloride	11L20-N06	1
Fagron	Diltiazem hydrochloride	11L20-N06	1
Fagron	Diltiazem hydrochloride	12/12-N02	4
Caelo	Diltiazem hydrochloride	12/12-N02	1
Gehe	Diltiazem hydrochloride	12/12-N02	1
Piramal Healthcare Ltd....	Diltiazem hydrochloride	12/12-N02	1
Sanacorp	Diltiazem hydrochloride	12/12-N02	2
Caelo	Diltiazem hydrochloride	12133006	1
Caelo	Diltiazem hydrochloride	12133008	2
Alliance	Diltiazem hydrochloride	12133008	1
Gehe	Diltiazem hydrochloride	12133009	1
Caelo	Diltiazem hydrochloride	12133009	7
Alliance	Diltiazem hydrochloride	12133009	1
Caelo	Diltiazem hydrochloride	12133010	16
Kehr	Diltiazem hydrochloride	12133010	1
Noweda	Diltiazem hydrochloride	12133010	1
Caesar & Loretz GmbH	Diltiazem hydrochloride	12133010	1
Sanacorp	Diltiazem hydrochloride	12133010	1
Gehe	Diltiazem hydrochloride	12133010	1
Caelo	Diltiazem hydrochloride	12133011	4
Noweda	Diltiazem hydrochloride	12133022	1
Gehe	Diltiazem hydrochloride	12133022	1
Caelo	Diltiazem hydrochloride	12133023	2
Caelo	Diltiazem hydrochloride	12133028	4
Caelo	Diltiazem hydrochloride	12133029	3
Noweda	Diltiazem hydrochloride	12133029	1
Caelo	Diltiazem hydrochloride	12133032	1
Noweda	Diltiazem hydrochloride	12176801	1
Caelo	Diltiazem hydrochloride	12176801	2
Anzag, 03.11.2012	Diltiazem hydrochloride	12176801	1
Phönix	Diltiazem hydrochloride	12176801	1
Caelo	Diltiazem hydrochloride	12176804	1
Caelo	Diltiazem hydrochloride	12177101	14
Fagron	Diltiazem hydrochloride	12d05-n07	2
Fagron	Diltiazem hydrochloride	12D05-n07	1
Noweda	Diltiazem hydrochloride	12D05-N07	1
Phönix, 28.03.2013	Diltiazem hydrochloride	12D05-N07	1
Fagron	Diltiazem hydrochloride	12D05-N070	1
Fagron	Diltiazem hydrochloride	12F19-N100102/574	1
Gehe	Diltiazem hydrochloride	12F19-N10	1
Piramaral Healthcare LTD.	Diltiazem hydrochloride	12F19-N10	1
Fagron	Diltiazem hydrochloride	12I12-N02	2
Alliance Healthcare	Diltiazem hydrochloride	12I12-N02	1
Fagron	Diltiazem hydrochloride	12K07-N02	2
Fagron	Diltiazem hydrochloride	12l12-N02	1
Caelo	Diltiazem hydrochloride	1319604	1
Caelo	Diltiazem hydrochloride	13196103	4
Caelo	Diltiazem hydrochloride	13196104	10

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Supplier	Substance	Batch	Spectra
Caelo	Diltiazem hydrochloride	13196105	20
Caelo	Diltiazem hydrochloride	13196107	3
Caelo	Diltiazem hydrochloride	1334609	1
Noweda	Diltiazem hydrochloride	13346901	1
Fagron	Diltiazem hydrochloride	13346902	1
Phoenix	Diltiazem hydrochloride	13346914	1
Alliance Health	Diltiazem hydrochloride	13A02-N05	1
Fagron	Diltiazem hydrochloride	13a02-n05	1
Fagron	Diltiazem hydrochloride	13A02N05	3
AHD, 26.08.13	Diltiazem hydrochloride	13A02-N05	1
Fagron	Diltiazem hydrochloride	13F13-N05	11
Phönix	Diltiazem hydrochloride	13F13-N05	1
Bombastus	Diltiazem hydrochloride	13F13-N05	1
Fagron	Diltiazem hydrochloride	13G16-N005	1
Caelo	Diltiazem hydrochloride	13G16-No5	1
Sanacorp	Diltiazem hydrochloride	13j24-b04-286569	1
Fagron	Diltiazem hydrochloride	13J24-B04-286570	1
Caelo	Diltiazem hydrochloride	13j24-b04-286571	1
Fagron	Diltiazem hydrochloride	15B12-B01-305299	1
Caelo	Diltiazem hydrochloride	15B12-B01-305400	1
Caelo	Diltiazem hydrochloride	20160812-1	1
Caelo	Diltiazem hydrochloride	2310213562	1
Caelo	Diltiazem hydrochloride	2704213562	1
Caelo	Diltiazem hydrochloride	3313U-03562	1
Fagron	Diltiazem hydrochloride	3713M-03562	1
Fagron	Diltiazem hydrochloride	3948/V03/18	1
Caelo	Diltiazem hydrochloride		1
Caelo	Diltiazem hydrochloride	DIL/M-04511	1
Herbasinica	Diltiazem hydrochloride		1
Caelo	Diltiazem hydrochloride	DIL/M-19911	1
VDL;18.02.15;15,95EUR	Diltiazem hydrochloride	14059514	1
Caelo	Diltiazem hydrochloride	13196106	3
Fagron	Diltiazem hydrochloride	15b12-b01-305400	2
Sanacorp, 18.02.17, 16,...	Diltiazem hydrochloride	16190807	1
Caelo	Diltiazem hydrochloride	11134121	1
Caelo	Diltiazem hydrochloride	1233011	1
Caelo	Diltiazem hydrochloride	12D05-N07	1
Fagron	Diltiazem hydrochloride	13j24-b04-286569	1
Fagron	Diltiazem hydrochloride	14c12-b04-294134	1
Fagron	Diltiazem hydrochloride	14C12-B04-294135	1
Caelo	Diltiazem hydrochloride	11134101	1
Caelo	Diltiazem hydrochloride	11134115	1
Fagron	Diltiazem hydrochloride	12/12-N02	1
Sanacorp	Diltiazem hydrochloride	12I12-N02	1
Caelo	Diltiazem hydrochloride	1396103	1

- 76 177 spectra from 463 *Apo-Ident* customers from a total of 25 312 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Diltiazem hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this

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purpose, all relevant spectra of the various substances were compared with *Diltiazem hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	72 273
Type B	0	270	0	161 803
Type C	0	893	89	76 177

The substance/substance group *Diltiazem hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 97.7778 %)
Type C	100.0000 % (> 99.8849 %)	90.9369 % (> 90.6314 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21270	22631	14.57	48.49
21300	22631	12.23	39.16
22631	22631	0.00	48.35
23016	22631	17.71	49.35

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Dimethyl fumarate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	21558-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Dimethyl fumarate

Special notes

When selecting the *Dimethyl fumarate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Dimethyl fumarate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Dimethyl fumarate	13269801	21558	40	1506634
Euro OTC	Dimethyl fumarate	1410013-01	21833	40	20141125

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 80 spectra of 2 reference samples from the substance/substance group *Dimethyl fumarate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 2 different batches.

- 72 353 spectra from a total of 1580 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 80 spectra from 3 reference samples of the substance/substance group *Dimethyl fumarate*.

- These include spectra of independent samples from 1 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Dimethyl fumarate	13269801	21558†	20
Euro OTC	Dimethyl fumarate	1410013-01	21833†	20
Euro OTC	Dimethyl fumarate	1601013-01	23907	40

- 161 993 spectra from a total of 3496 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 0 spectra from 0 *Apo-Ident* customers from 0 batches from the substance/substance group *Dimethyl fumarate*.

- These include spectra of independent samples from 0 batches, of which no spectra have been used for the generation of the database.

- 77 159 spectra from 463 *Apo-Ident* customers from a total of 25 547 batches from a further 701 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Dimethyl fumarate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Dimethyl fumarate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	72 353
Type B	0	80	0	161 993
Type C	0	0	0	77 159

The substance/substance group *Dimethyl fumarate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 92.5000 %)
Type C	100.0000 % (> 99.8849 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21558	21558	0.00	57.53
21833	21558	5.04	64.25

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Diphenhydramine hydrochloride**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20186-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Diphenhydramine hydrochloride; Diphenhydramini hydrochloridum; Diphenhydraminum hydrochloricum

Special notes

When selecting the *Diphenhydramine hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Diphenhydramine hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Diphenhydramine …	12329816	21464	30	20121119
Caelo	Diphenhydramine …	16004901	23235	40	20160122
Fagron	Diphenhydramine …	16C25-B03-331026	23262	40	AR-17-FG-015432-02

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 110 spectra of 3 reference samples from the substance/substance group *Diphenhydramine - hydrochloride*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 323 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 240 spectra from 6 reference samples of the substance/substance group *Diphenhydramine - hydrochloride*.

- These include spectra of independent samples from 4 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Diphenhydramine hydrochloride	82811299	20186	50
Caelo	Diphenhydramine hydrochloride	82811179	20321	40
Caelo	Diphenhydramine hydrochloride	12329816	21304	40
Caelo	Diphenhydramine hydrochloride	12329816	21464†	30
Caelo	Diphenhydramine hydrochloride	15072617	23206	40
Caelo	Diphenhydramine hydrochloride	172276	23803	40

- 161 833 spectra from a total of 3494 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 76 spectra from 44 *Apo-Ident* customers from 45 batches from the substance/substance group *Diphenhydramine hydrochloride*.

- These include spectra of independent samples from 43 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Diphenhydramine hydrochloride	2041403	1
PHOENIX 29.01.2013	Diphenhydramine hydrochloride	120208	1
Caelo	Diphenhydramine hydrochloride	12329805	1
Caelo	Diphenhydramine hydrochloride	12329815	2
Caelo	Diphenhydramine hydrochloride	12329816	1
Caelo	Diphenhydramine hydrochloride	13100462	1
Caelo	Diphenhydramine hydrochloride	13331810	1
Caelo	Diphenhydramine hydrochloride	13331813	1
Caelo	Diphenhydramine hydrochloride	13343104	1
Fagron	Diphenhydramine hydrochloride	13A14-B40-293346	1
Caelo	Diphenhydramine hydrochloride	15072602	3
Caelo	Diphenhydramine hydrochloride	15072603	4
Caelo	Diphenhydramine hydrochloride	15072608	1
Caelo	Diphenhydramine hydrochloride	15072609	4
Caelo	Diphenhydramine hydrochloride	15072614	4
Caelo	Diphenhydramine hydrochloride	15072630	1
Caelo	Diphenhydramine hydrochloride	15220402	1
Noweda	Diphenhydramine hydrochloride	15220402	1
Caelo	Diphenhydramine hydrochloride	15220403	2
Caelo	Diphenhydramine hydrochloride	15220404	3
Caelo	Diphenhydramine hydrochloride	15220405	3
Caelo	Diphenhydramine hydrochloride	16004908	1
Caelo	Diphenhydramine hydrochloride	16004910	1
Fagron	Diphenhydramine hydrochloride	16C25-B03-331026	1
Caelo	Diphenhydramine hydrochloride	1814A-01339	1
Caelo	Diphenhydramine hydrochloride	1912I-01339	1
Caelo	Diphenhydramine hydrochloride	20071502	1
Caelo	Diphenhydramine hydrochloride	2215I-01339	1
Caelo	Diphenhydramine hydrochloride	31031508	1
Gatt-Koller	Diphenhydramine hydrochloride	606030315	1
Caelo	Diphenhydramine hydrochloride	4061205	1
Caelo	Diphenhydramine hydrochloride	5121204	1
Finze	Diphenhydramine hydrochloride	9F05-N04	3
Caelo	Diphenhydramine hydrochloride	10122030	4
Caelo	Diphenhydramine hydrochloride	12007702	1
Caesar/Noweda	Diphenhydramine hydrochloride	12007714	1
Caelo	Diphenhydramine hydrochloride	12007715	2
Caelo	Diphenhydramine hydrochloride	12007716	1
Noweda	Diphenhydramine hydrochloride	12007716	1
Caelo	Diphenhydramine hydrochloride	12007720	1
Caelo	Diphenhydramine hydrochloride	12007721	3
Sanacorp	Diphenhydramine hydrochloride	12329805	1
Phoenix, 18.09.2012	Diphenhydramine hydrochloride	12F28-N01	1
Fagron	Diphenhydramine hydrochloride	12F28-N01	1
Anzag 16.03.2013	Diphenhydramine hydrochloride	12J04-N02	1
Fagron	Diphenhydramine hydrochloride	12J04-N02	2
Fagron	Diphenhydramine hydrochloride	12L17-N03	1
Caelo	Diphenhydramine hydrochloride	25071306	1

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Supplier	Substance	Batch	Spectra
Fagron	Diphenhydramine hydrochloride	13A14-B40	1
Caelo	Diphenhydramine hydrochloride	12007713	1

- 77 083 spectra from 463 *Apo-Ident* customers from a total of 25 503 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Diphenhydramine hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Diphenhydramine hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	110	0	72 323
Type B	0	239	1	161 833
Type C	0	52	24	77 083

The substance/substance group *Diphenhydramine hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 94.5455 %)
Type B	100.0000 % (> 99.9928 %)	99.5833 % (> 98.3333 %)
Type C	100.0000 % (> 99.8850 %)	68.4211 % (> 64.4737 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21464	23262	20.34	40.97
23235	23262	11.14	41.11
23262	23262	0.00	40.00

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Diphenylcyclopropenone**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	`20934-2018-07-18`
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Diphenylcyclopropenone; Diphenylcyclopropenonum

Special notes

When selecting the *Diphenylcyclopropenone* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Diphenylcyclopropenone*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Diphenylcyclopro…	`12L17-N07`	20934	40	`1407599`
Fagron	Diphenylcyclopro…	`15J12-B01-316620`	22362	40	`9341`
Fagron	Diphenylcyclopro…	`16F02-B10-329708`	23070	40	`20160822`

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Diphenylcyclopropenone*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 137 spectra from 5 reference samples of the substance/substance group *Diphenylcyclopropenone*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Diphenylcyclopropenone	13I26-N12	21342	40
Fagron	Diphenylcyclopropenone	13I26-N12	21539	35
Fagron	Diphenylcyclopropenone	15J12-B01-316620	22362†	20
Fagron	Diphenylcyclopropenone	16F02-B10-326265	23071	40
Fagron	Diphenylcyclopropenone	16F02-B10-327812	not required	2

- 161 936 spectra from a total of 3495 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 2 spectra from 1 *Apo-Ident* customers from 1 batches from the substance/substance group *Diphenylcyclopropenone*.

- These include spectra of independent samples from 1 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Frago/Noweda	Diphenylcyclopropenone	16F02-B10-324263	2

- 77 157 spectra from 463 *Apo-Ident* customers from a total of 25 546 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Diphenylcyclopropenone* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Diphenylcyclopropenone* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	22	115	161 936
Type C	0	2	0	77 157

The substance/substance group *Diphenylcyclopropenone* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	16.0584 % (> 13.8686 %)
Type C	100.0000 % (> 99.8856 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20934	20934	0.00	30.00
22362	22362	0.00	23.99
23070	22362	12.17	24.44

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Doxycycline hyclate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20796-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Doxycycline hyclate; Doxycyclini hyclas; Doxycyclinum hemiaethanolicum hemihydricum

Special notes

When selecting the *Doxycycline hyclate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Doxycycline hyclate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Doxycycline hycl…	12G12-N15	20796	40	1404233
Fagron	Doxycycline hycl…	12G12-N15	20821	40	20120807
Fagron	Doxycycline hycl…	14K28-B05-312218	22242	40	20150216

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Doxycycline hyclate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 2 different batches.

- 72 313 spectra from a total of 1580 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 60 spectra from 2 reference samples of the substance/substance group *Doxycycline hyclate*.

- These include spectra of independent samples from 1 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Doxycycline hyclate	14K28-B05-312218	22242†	20
Fagron	Doxycycline hyclate	16I06-B02-330167	23118	40

- 162 013 spectra from a total of 3497 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 5 spectra from 4 *Apo-Ident* customers from 5 batches from the substance/substance group *Doxycycline hyclate*.

- These include spectra of independent samples from 4 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Löwen City-Apotheke Bar…	Doxycycline hyclate	2042015	1
Fagron	Doxycycline hyclate	12G12-N15	1
Fagron	Doxycycline hyclate	13D24-B40-298948	1
Fagron	Doxycycline hyclate	16106-B02-330167	1
Löwen City-Apotheke Bar…	Doxycycline hyclate	10022014	1

- 77 154 spectra from 463 *Apo-Ident* customers from a total of 25 543 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Doxycycline hyclate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Doxycycline hyclate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	60	0	162 013
Type C	0	5	0	77 154

The substance/substance group *Doxycycline hyclate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 90.0000 %)
Type C	100.0000 % (> 99.8852 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20796	20796	0.00	32.21
20821	20796	1.93	31.78
22242	20796	10.24	32.61

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Doxylamine hydrogen succinate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20315-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Doxylamine hydrogen succinate; Doxylamine succinate; Doxylamini hydrogenosuccinas; Doxylaminum succinicum

Special notes

When selecting the *Doxylamine hydrogen succinate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Doxylamine hydrogen succinate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Doxylamine hydro…	14F03-B01-293498	21542	40	1410524
Fagron	Doxylamine hydro…	15F01-B04-309189	22601	40	AR-16-FG-011361-01
Caelo	Doxylamine hydro…	15203906	23085	40	20151112

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Doxylamine hydrogen succinate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 140 spectra from 4 reference samples of the substance/substance group *Doxylamine hydrogen succinate*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Doxylamine hydrogen succinate	700296	20315	40
Fagron	Doxylamine hydrogen succinate	14F03-B01-293498	21542†	20
Caelo	Doxylamine hydrogen succinate	15203906	23086	40
Caelo	Doxylamine hydrogen succinate	172047	23626	40

- 161 933 spectra from a total of 3495 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 46 spectra from 13 *Apo-Ident* customers from 23 batches from the substance/substance group *Doxylamine hydrogen succinate*.

- These include spectra of independent samples from 22 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Doxylamine hydrogen succinate	12E29-N03	1
Fagron	Doxylamine hydrogen succinate	14K27-B07	1
Fagron	Doxylamine hydrogen succinate	15F01-B04-309189	2
Fagron	Doxylamine hydrogen succinate	14F03-B01-296846	1
Caelo	Doxylamine hydrogen succinate	14k27-B07	1
Fagron	Doxylamine hydrogen succinate	15K04-B01	1
Caelo	Doxylamine hydrogen succinate	15K04B01327356	1
Fagron	Doxylamine hydrogen succinate	12E04-N04	4
Fagron	Doxylamine hydrogen succinate	12G10-N03	6
Caesar & Loretz GmbH, 4…	Doxylamine hydrogen succinate	13A04-N02	4
Fagron	Doxylamine hydrogen succinate	13E29-N03	4
Fagron	Doxylamine hydrogen succinate	12811420001	1
Fagron	Doxylamine hydrogen succinate	13/26-N14	1
Fagron	Doxylamine hydrogen succinate	13A04-N02	3
Fagron	Doxylamine hydrogen succinate	14F03B01293498	1
Fagron	Doxylamine hydrogen succinate	14F03-B01-296845	1
Fagron	Doxylamine hydrogen succinate	14K27-B07-303356	1
Caelo	Doxylamine hydrogen succinate	15F01-B04-317385	2
Fagron	Doxylamine hydrogen succinate	15K04B01321379	1
Fagron	Doxylamine hydrogen succinate	483875887	1
Fagron	Doxylamine hydrogen succinate	11G20-N10	1
Fagron	Doxylamine hydrogen succinate	11K17-N04	3
Fagron	Doxylamine hydrogen succinate	12K21-N01	3
Fagron	Doxylamine hydrogen succinate	12811328003	1

- 77 113 spectra from 463 *Apo-Ident* customers from a total of 25 525 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Doxylamine hydrogen succinate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Doxylamine hydrogen succinate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	140	0	161 933
Type C	0	39	7	77 113

The substance/substance group *Doxylamine hydrogen succinate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 95.7143 %)
Type C	100.0000 % (> 99.8850 %)	84.7826 % (> 78.2609 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21542	21542	0.00	27.58
22601	22601	0.00	29.44
23085	22601	8.58	31.35

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Drofenine hydrochloride**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20320-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Drofenine hydrochloride; Drofenini hydrochloridum; Drofeninum hydrochloricum

Special notes

When selecting the *Drofenine hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Drofenine hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Drofenine hydroc…	13I09-N05	21275	40	20130524
Fagron	Drofenine hydroc…	15G01-B04-330979	23233	40	AR-17-FG-015434-02

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 80 spectra of 2 reference samples from the substance/substance group *Drofenine hydrochloride*. These samples are listed above in the section *calibration samples*. The reference samples originate from 2 different batches.

- 72 353 spectra from a total of 1580 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 120 spectra from 3 reference samples of the substance/substance group *Drofenine hydrochloride*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Drofenine hydrochloride	10K29	20320	40
Fagron	Drofenine hydrochloride	15G01-B04-323028	22807	40
Fagron	Drofenine hydrochloride	15G01-B04-330979	23412	40

- 161 953 spectra from a total of 3496 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

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- 2 spectra from 1 *Apo-Ident* customers from 2 batches from the substance/substance group *Drofenine hydrochloride*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Drofenine hydrochloride	11J24-N01	1
Fagron	Drofenine hydrochloride	12D04-N03	1

- 77 157 spectra from 463 *Apo-Ident* customers from a total of 25 545 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Drofenine hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Drofenine hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	72 353
Type B	0	120	0	161 953
Type C	0	2	0	77 157

The substance/substance group *Drofenine hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 95.0000 %)
Type C	100.0000 % (> 99.8856 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21275	23233	7.25	49.64
23233	23233	0.00	50.76

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Econazole nitrate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	`20849-2018-07-18`
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Econazole nitrate; Econazoli nitras; Econazolum nitricum

Special notes

When selecting the *Econazole nitrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Econazole nitrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Econazole nitrate	`12H08-N02`	20849	40	`1312442`
Fagron	Econazole nitrate	`11F09-N16`	21268	40	`20110606`
Fagron	Econazole nitrate	`12I06-B40-306925`	22392	40	`AR-16-FG-011359-01`

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Econazole nitrate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 80 spectra from 2 reference samples of the substance/substance group *Econazole nitrate*.

- These include spectra of independent samples from 1 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Econazole nitrate	14G22-B07-327805	23079	40
Fagron	Econazole nitrate	12I06-B40-306925	22392SI	40

- 161 993 spectra from a total of 3497 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 4 spectra from 3 *Apo-Ident* customers from 3 batches from the substance/substance group *Econazole nitrate*.

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- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Econazole nitrate	12I06-B40-289953	2
Fagron	Econazole nitrate	11F09-N16	1
Fagron	Econazole nitrate	13D22-N06	1

- 77 155 spectra from 463 *Apo-Ident* customers from a total of 25 544 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Econazole nitrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Econazole nitrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	80	0	161 993
Type C	0	4	0	77 155

The substance/substance group *Econazole nitrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 92.5000 %)
Type C	100.0000 % (> 99.8853 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20849	20849	0.00	32.19
21268	22392	8.14	36.20
22392	22392	0.00	31.82

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Eosin Y**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20571-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Eosin Y; Eosinum natricum

Special notes

When selecting the *Eosin Y* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Eosin Y*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Eosin Y	12E25-N01	20900	55	20120607
Fagron	Eosin Y	13I11-N03	20932	40	20130925
Fagron	Eosin Y	13I11-N03	21208	40	20130925
Fagron	Eosin Y	15G01-T03-025958	22261	40	1604114
Fagron	Eosin Y	13F14-T01-017395	22534	40	1608469

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Eosin Y	13F14-T01-017395	22660	40	1801115
Fagron	Eosin Y	13F14-T01-017395	22816	40	1705197
Fagron	Eosin Y	17K21-T07-042542	23975	40	1805338

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 335 spectra of 8 reference samples from the substance/substance group *Eosin Y*. These samples are listed above in the section *calibration samples*. The reference samples originate from 5 different batches.

- 72 098 spectra from a total of 1577 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 105 spectra from 4 reference samples of the substance/substance group *Eosin Y*.

- These include spectra of independent samples from 1 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Eosin Y	12A02-N09	20571	40
Fagron	Eosin Y	12E25-N01	20900†	5
Fagron	Eosin Y	15G01-T03-025958	22261†	20
Fagron	Eosin Y	13F14-T01-017395	22535	40

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 968 spectra from a total of 3495 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 46 spectra from 40 *Apo-Ident* customers from 21 batches from the substance/substance group *Eosin Y*.

- These include spectra of independent samples from 17 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Eosin Y	13F14-T01-017395	1
Fagron	Eosin Y	13/11-N03	4
Fagron	Eosin Y	13F14-T01-017395	6
Cael Sanacorp 05.02.2016	Eosin Y	13F14-T01-017395	1
Fagron	Eosin Y	13fF14-T01-017395	1
Caelo	Eosin Y	13I11-N03	1
Caelo	Eosin Y	14H28-M05	1
Fagron	Eosin Y	14H28-M05	2
sanacorp	Eosin Y	14H28-M05	1
Gehe	Eosin Y	14H28-M05	1
Fargon	Eosin Y	14H28-M09	1
Fagron	Eosin Y	15G01-T03-025958	2
Caelo	Eosin Y	15G01-T03-025958	1
Fagron	Eosin Y	15G01T03025959	1
Fagron	Eosin Y	EYWS/15/13	1
Fagron	Eosin Y	11E25-N01	1
Fagron	Eosin Y	17372-87-1	1
Fagron	Eosin Y	11F21-N10	1
Fagron	Eosin Y	12A02-N09	1
Caelo	Eosin Y	12e25-n01	1
Sanacorp	Eosin Y	12E25-N01	1
Fagron	Eosin Y	12E25-N01	4
Fagron	Eosin Y	12H28-N08	3
Fargon/Sanacorp	Eosin Y	13/11-No3	1
Fagron	Eosin Y	13/11-NO3	1
Fagron	Eosin Y	2512A-01357	1
Fagron	Eosin Y	EYWS/16/11	2
Fagron	Eosin Y	14H28-M09	2
Caelo	Eosin Y	12e25n01	1

- 77 113 spectra from 463 *Apo-Ident* customers from a total of 25 526 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Eosin Y* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Eosin Y* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	231	104	72 098
Type B	0	31	74	161 968
Type C	0	32	14	77 113

The substance/substance group *Eosin Y* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9887 %)	68.9552 % (> 68.0597 %)
Type B	100.0000 % (> 99.9928 %)	29.5238 % (> 26.6667 %)
Type C	100.0000 % (> 99.8850 %)	69.5652 % (> 63.0435 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20900	22660	9.86	88.41
20932	22816	11.57	81.59
21208	22660	9.31	80.01
22261	22261	0.00	60.32
22534	22534	0.00	64.40
22660	22660	0.00	87.50
22816	22816	0.00	81.63
23975	23975	0.00	70.09

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Ephedrine hydrochloride**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20993-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Ephedrine hydrochloride; Ephedrini hydrochloridum; Ephedrinum hydrochloricum

Special notes

When selecting the *Ephedrine hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Ephedrine hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Ephedrine hydroc…	12017217	20993	40	1511635
Caelo	Ephedrine hydroc…	13323305	21322	40	20131113
Caelo	Ephedrine hydroc…	14378502	21803	40	20150106
Caelo	Ephedrine hydroc…	161197	22436	40	20160420*
Fagron	Ephedrine hydroc…	17G05-B05-337987	23927	40	20170901

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 200 spectra of 5 reference samples from the substance/substance group *Ephedrine hydrochloride*. These samples are listed above in the section *calibration samples*. The reference samples originate from 5 different batches.

- 72 233 spectra from a total of 1577 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 160 spectra from 5 reference samples of the substance/substance group *Ephedrine hydrochloride*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Ephedrine hydrochloride	10103408	20228	40
Caelo	Ephedrine hydrochloride	14378502	21803†	20
Caelo	Ephedrine hydrochloride	161197	22436†	20
Fagron	Ephedrine hydrochloride	15H28-B02-316349	23073	40
Caelo	Ephedrine hydrochloride	171736	23672	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 913 spectra from a total of 3494 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 45 spectra from 21 *Apo-Ident* customers from 35 batches from the substance/substance group *Ephedrine hydrochloride*.

- These include spectra of independent samples from 32 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
GATT-KOLLER/PHOENIX	Ephedrine hydrochloride	915/03141314	2
Phoenix 04.03.14	Ephedrine hydrochloride	1332303	1
Caelo	Ephedrine hydrochloride	13323302	1
PHOENIX 10.03.2014	Ephedrine hydrochloride	13323302	1
Gehe am 04.03.14	Ephedrine hydrochloride	13323303	1
Phönix	Ephedrine hydrochloride	13323305	2
Caelo	Ephedrine hydrochloride	13323309	1
Caelo	Ephedrine hydrochloride	13323310	1
Caelo	Ephedrine hydrochloride	13323316	1
Phönix	Ephedrine hydrochloride	13323315	1
Fagron	Ephedrine hydrochloride	13L30-B36	1
Caelo	Ephedrine hydrochloride	14378502	1
Caesar & Loretz GmbH	Ephedrine hydrochloride	14378503	1
Caelo	Ephedrine hydrochloride	14378506	2
Caelo	Ephedrine hydrochloride	14378507	1
Caelo	Ephedrine hydrochloride	14378510	2
Caesar & Loretz GmbH	Ephedrine hydrochloride	16119702	1
Caelo	Ephedrine hydrochloride	15179302	1
Caelo	Ephedrine hydrochloride	16119703	2
Gatt-Koller / Phoenix	Ephedrine hydrochloride	18502141114	1
Caelo	Ephedrine hydrochloride	16119709	1
Caelo	Ephedrine hydrochloride	10103425	1
Caelo	Ephedrine hydrochloride	11126407	1
Caesar & Loretz GmbH, 4...	Ephedrine hydrochloride	11126411	1
Anzag, 24.10.2012	Ephedrine hydrochloride	12017205	2
Caelo	Ephedrine hydrochloride	11126414	1
Phönix 01.12.12	Ephedrine hydrochloride	12017207	1
Caelo	Ephedrine hydrochloride	12017209	2
Caelo	Ephedrine hydrochloride	12017215	1
Caelo	Ephedrine hydrochloride	12017217	1
Fagron	Ephedrine hydrochloride	12017220	1
Phönix 05.11.2013	Ephedrine hydrochloride	12017223	1
Caelo	Ephedrine hydrochloride	12017223	1
Fagron	Ephedrine hydrochloride	13B19-N04	1
Caelo	Ephedrine hydrochloride	3967/V03/16	1
Caelo	Ephedrine hydrochloride	EphedrinHCL1	1
Caelo	Ephedrine hydrochloride	EphedrinHCL2	1
Caelo	Ephedrine hydrochloride	12017207	1

- 77 114 spectra from 463 *Apo-Ident* customers from a total of 25 512 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Ephedrine hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ephedrine hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	200	0	72 233
Type B	0	160	0	161 913
Type C	0	45	0	77 114

The substance/substance group *Ephedrine hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 96.2500 %)
Type C	100.0000 % (> 99.8850 %)	100.0000 % (> 86.6667 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20993	20993	0.00	41.18
21322	20993	5.32	38.70
21803	20993	1.92	40.71
22436	22436	0.00	44.46
23927	22436	26.65	58.73

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Epinephrine hydrogen tartrate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20689-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Epinephrine hydrogen tartrate; Adrenaline hydrogen tartrate; Adrenalini tartras; Adrenalinum bitartaricum

Special notes

When selecting the *Epinephrine hydrogen tartrate* substance/substance group, the following information is displayed to the user:

- Advice for the identification of epinephrine bitartrate: According to the BfArM, ephedrine and its salts are considered as critical drugs in compliance to § 5 AMG. Critical drugs must not be placed on the market or be applied to humans.

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Epinephrine hydrogen tartrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Epinephrine hydr…	12120202	20689	40	1405614
Fagron	Epinephrine hydr…	12L22-N04	20749	40	20120106

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Epinephrine hydr…	12337804	21058	40	20121128
Caelo	Epinephrine hydr…	14007802	21489	40	1603180
Caelo	Epinephrine hydr…	14007802	21490	40	20140130
Caelo	Epinephrine hydr…	14007802	21489SI	40	1603180

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 240 spectra of 6 reference samples from the substance/substance group *Epinephrine hydrogen tartrate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 4 different batches.

- 72 193 spectra from a total of 1578 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 735 spectra from 26 reference samples of the substance/substance group *Epinephrine hydrogen tartrate*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Epinephrine hydrogen tartrate	12337805	21059	40
Caelo	Epinephrine hydrogen tartrate	14007802	21489†	20
Caelo	Epinephrine hydrogen tartrate	14007802	21490†	20
Caelo	Epinephrine hydrogen tartrate	14007802	21491	20
Caelo	Epinephrine hydrogen tartrate	14007802	21492	20
Caelo	Epinephrine hydrogen tartrate	14007802	21493	20
Caelo	Epinephrine hydrogen tartrate	14007802	21494	60
Caelo	Epinephrine hydrogen tartrate	14007802	21495	20
Caelo	Epinephrine hydrogen tartrate	14007802	21496	20

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Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Epinephrine hydrogen tartrate	14007802	21497	20
Caelo	Epinephrine hydrogen tartrate	14007802	21498	20
Caelo	Epinephrine hydrogen tartrate	162764	22777	40
Caelo	Epinephrine hydrogen tartrate	171115	23323	40
Caelo	Epinephrine hydrogen tartrate	171115	23326	40
Caelo	Epinephrine hydrogen tartrate	14007802	21489SI[†]	20
Caelo	Epinephrine hydrogen tartrate	14007802	21490SI	60
Caelo	Epinephrine hydrogen tartrate	14007802	21491SI	20
Caelo	Epinephrine hydrogen tartrate	14007802	21492SI	20
Caelo	Epinephrine hydrogen tartrate	14007802	21493SI	20
Caelo	Epinephrine hydrogen tartrate	14007802	21495SI	20
Caelo	Epinephrine hydrogen tartrate	14007802	21496SI	20
Caelo	Epinephrine hydrogen tartrate	14007802	21497SI	20
Caelo	Epinephrine hydrogen tartrate	14007802	21498SI	20
Caelo	Epinephrine hydrogen tartrate	162764	22777SI	40
Caelo	Epinephrine hydrogen tartrate	171115	23323SI	35
Caelo	Epinephrine hydrogen tartrate	171115	23326SI	40

- 161 338 spectra from a total of 3495 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 35 spectra from 20 *Apo-Ident* customers from 27 batches from the substance/substance group *Epinephrine hydrogen tartrate*.

- These include spectra of independent samples from 25 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Epinephrine hydrogen tartrate	11L22-N04	1
Caelo	Epinephrine hydrogen tartrate	15239701	2
Fagron	Epinephrine hydrogen tartrate	12G11-N07	1
Caelo	Epinephrine hydrogen tartrate	12120202	1
Caelo	Epinephrine hydrogen tartrate	12337801	2
Phoenix 22.5.14	Epinephrine hydrogen tartrate	12337804	1
Alliance Health 12.03.14	Epinephrine hydrogen tartrate	12337805	1
Fagron	Epinephrine hydrogen tartrate	14E12-B02	1
Caelo	Epinephrine hydrogen tartrate	14301002	2
Caelo	Epinephrine hydrogen tartrate	15194102	1
Caelo	Epinephrine hydrogen tartrate	15239703	1
Fagron	Epinephrine hydrogen tartrate	15A13-B02-305559	2
Caelo	Epinephrine hydrogen tartrate	162746402	1
Fagron	Epinephrine hydrogen tartrate	16E09-B11-319882	3

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[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Supplier	Substance	Batch	Spectra
Fagron	Epinephrine hydrogen tartrate	16e09-b11-319882	1
Caelo	Epinephrine hydrogen tartrate	17111503	2
Fagron	Epinephrine hydrogen tartrate	12/02-N03	1
Caelo	Epinephrine hydrogen tartrate	123337805	1
Caelo	Epinephrine hydrogen tartrate	12337805	1
Fagron	Epinephrine hydrogen tartrate	12G11-No70076/130	1
Fagron	Epinephrine hydrogen tartrate	13I04-N03	1
Fagron	Epinephrine hydrogen tartrate	13I04-NO3	1
Caelo	Epinephrine hydrogen tartrate	14007808	1
Caelo	Epinephrine hydrogen tartrate	210316-3	1
AHD 17.11.14 EK 7,60	Epinephrine hydrogen tartrate		1
Caelo	Epinephrine hydrogen tartrate	16276402	1
Caelo	Epinephrine hydrogen tartrate	10237109	1
Caelo	Epinephrine hydrogen tartrate	210316-1	1

- 77 124 spectra from 463 *Apo-Ident* customers from a total of 25 520 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Epinephrine hydrogen tartrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Epinephrine hydrogen tartrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	240	0	72 193
Type B	0	727	8	161 338
Type C	0	35	0	77 124

The substance/substance group *Epinephrine hydrogen tartrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.5000 %)
Type B	100.0000 % (> 99.9928 %)	98.9116 % (> 98.5034 %)
Type C	100.0000 % (> 99.8850 %)	100.0000 % (> 82.8571 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

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Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20689	20689	0.00	50.06
20749	21489	11.52	49.82
21058	20689	6.44	49.60
21489	21489	0.00	50.30
21490	21489	14.80	51.02

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Ergotamine tartrate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	`21341-2018-07-18`
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Ergotamine tartrate; Ergotamini tartras; Ergotaminum tartricum

Special notes

When selecting the *Ergotamine tartrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Ergotamine tartrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Ergotamine tartr…	`15B16-B05-308418`	`22361`	30	`9384`
Fagron	Ergotamine tartr…	`15B16-B05-308417`	`22722`	40	`20150302`
Fagron	Ergotamine tartr…	`15B16-B05-308418`	`22361SI`	30	`9384`
Fagron	Ergotamine tartr…	`15B16-B05-308417`	`22722SI`	40	`20150302`

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 140 spectra of 4 reference samples from the substance/substance group *Ergotamine tartrate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 2 different batches.

- 72 293 spectra from a total of 1580 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 236 spectra from 5 reference samples of the substance/substance group *Ergotamine tartrate*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Ergotamine tartrate	13H02-N01	21341	100
Fagron	Ergotamine tartrate	13I24-B10-288648	21540	46
Fagron	Ergotamine tartrate	13I24-B10-288650	21556	60
Fagron	Ergotamine tartrate	15B16-B05-308418	22361†	15
Fagron	Ergotamine tartrate	15B16-B05-308418	22361SI†	15

- 161 837 spectra from a total of 3495 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 0 spectra from 0 *Apo-Ident* customers from 0 batches from the substance/substance group *Ergotamine tartrate*.

- These include spectra of independent samples from 0 batches, of which no spectra have been used for the generation of the database.

- 77 159 spectra from 463 *Apo-Ident* customers from a total of 25 547 batches from a further 701 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Ergotamine tartrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ergotamine tartrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	140	0	72 293
Type B	0	168	68	161 837
Type C	0	0	0	77 159

The substance/substance group *Ergotamine tartrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.7143 %)
Type B	100.0000 % (> 99.9928 %)	71.1864 % (> 69.9153 %)
Type C	100.0000 % (> 99.8849 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
22361	22361	0.00	53.07
22722	22361	12.77	62.81

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Erythromycin**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20011-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Erythromycin; Erythromycinum

Special notes

When selecting the *Erythromycin* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Erythromycin*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Erythromycin	12E24-N04	21056	40	20120607
Caelo	Erythromycin	13175601	21323	40	20130620
Euro OTC	Erythromycin	1308016-02	21651	40	1412542
Fagron	Erythromycin	14B06-B35-290872	21669	40	20140225
Euro OTC	Erythromycin	1508034	21890	40	20150925*

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Erythromycin	160792	22438	40	20160408*
Euro OTC	Erythromycin	1607038	22832	40	20160831*
Euro OTC	Erythromycin	1705038	23438	40	20170705*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 320 spectra of 8 reference samples from the substance/substance group *Erythromycin*. These samples are listed above in the section *calibration samples*. The reference samples originate from 8 different batches.

- 72 113 spectra from a total of 1574 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 563 spectra from 12 reference samples of the substance/substance group *Erythromycin*.

- These include spectra of independent samples from 6 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Erythromycin	81907518	20011	80
Caelo	Erythromycin	10006107	20107	40
Fagron	Erythromycin	zu erfassen	21011	90
Fagron	Erythromycin	zu erfassen	21012	50
Euro OTC	Erythromycin	1308016-02	21651†	20
Fagron	Erythromycin	14B06-B35-290872	21669†	20

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*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Erythromycin	1508034	21890[†]	20
Caelo	Erythromycin	160792	22438[†]	20
Caelo	Erythromycin	160795	22439	60
Caelo	Erythromycin	160797	22440	60
Caelo	Erythromycin	160796	22442	60
Fagron	Erythromycin	14B06-B35-290872	21669SI	43

- 161 510 spectra from a total of 3490 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 1623 spectra from 369 *Apo-Ident* customers from 398 batches from the substance/substance group *Erythromycin*.

- These include spectra of independent samples from 387 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Erythromycin	3092014B	1
Caelo	Erythromycin	308160l	1
Caelo	Erythromycin	5052015D	1
Caelo	Erythromycin	10079203	1
Caelo	Erythromycin	10091502	1
Caelo	Erythromycin	11195402	6
Fagron	Erythromycin	11D13-N09	3
Caelo	Erythromycin	120503601	1
Cealo / Noweda	Erythromycin	1205036-02	1
Caelo	Erythromycin	12156206	2
Caelo	Erythromycin	12156208	7
Euro OTC	Erythromycin	1308016-01	27
Caelo	Erythromycin	1308016-01	4
Euro OTC	Erythromycin	130801601	7
EuRho	Erythromycin	1308016-01	4
GEHE 21.05.2014	Erythromycin	1308016-01	1
euroct/gehe	Erythromycin	1308016-01	1
euroct/gehe	Erythromycin	1308016-02	2
Euro OTC	Erythromycin	1308016-02	27
Caelo	Erythromycin	1308016-02	1
EuRho/Phönix	Erythromycin	1308016-02	1
EuRho	Erythromycin	1308016-02	2
Euro OTC	Erythromycin	130801602	2
Gehe	Erythromycin	1308016-02	1
Noweda	Erythromycin	130801602	2

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[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Supplier	Substance	Batch	Spectra
	Erythromycin	1308016-02	1
Euro OTC	Erythromycin	1308016-1	1
Adler Anzag 26.05.14	Erythromycin	13081601	1
Caelo	Erythromycin	13175502	8
Caelo	Erythromycin	1315802	1
Caelo	Erythromycin	13175503	9
Raben-Apotheke Mildenau	Erythromycin	13175601	2
Caelo	Erythromycin	13175504	8
Caelo	Erythromycin	13175505	4
Caelo	Erythromycin	13175506	4
Caelo	Erythromycin	13175601	12
Audor Pharma	Erythromycin	13175602	1
Fagron	Erythromycin	13175602	1
Caelo	Erythromycin	13175607	9
Caelo	Erythromycin	13175604	7
PHOENIX 08.05.2014	Erythromycin	13175604	1
gehe	Erythromycin	13175607	1
Noweda	Erythromycin	13175608	1
Caelo	Erythromycin	13175608	6
Fagron	Erythromycin	13175608	1
Gutenberg-Apotheke	Erythromycin	13175608	1
PHOENIX 08.05.2014	Erythromycin	13175608	2
Caesar & Loretz	Erythromycin	13175610	2
Caelo	Erythromycin	13175611	5
Caelo	Erythromycin	13175801	12
Caelo	Erythromycin	13175802	9
Caelo	Erythromycin	13175803	9
Caelo	Erythromycin	13175804	2
Caelo	Erythromycin	13175809	8
Caelo	Erythromycin	13175808	3
Caelo	Erythromycin	13175810	5
Fagron	Erythromycin	13175810	1
Caelo	Erythromycin	13175811	8
Caelo	Erythromycin	13178756tzgklhj	1
Caelo	Erythromycin	13D30-N01	6
Fagron	Erythromycin	13D30-N01	25
Fagron	Erythromycin	13F12-N21	32
Fagron	Erythromycin	13f12-n21	1
Alliance Health 28.01.2...	Erythromycin	13F12-N21	1
Caelo	Erythromycin	13H22-N07	1
Fagron	Erythromycin	13H22-N070228/246	1
Fagron	Erythromycin	13H22-N07	8
Fagron	Erythromycin	13H22-NO7	1
Fagron	Erythromycin	14/30-B01-308789	3
Fagron	Erythromycin	14/30-B01	1
Fagron	Erythromycin	14/30-B01308790	1
Caelo	Erythromycin	14/30-B01-300059	1
Fagron	Erythromycin	14/30-B01-300060	2
Fagron	Erythromycin	14/30B0130050	1
Fagron	Erythromycin	1430-B01-303884	1
Fagron	Erythromycin	14/30-B01-303884	1
Fagron	Erythromycin		3
Caelo	Erythromycin		2
Fagron	Erythromycin	14/30-B01-308189	2
Caelo	Erythromycin	14044001	15
Caelo	Erythromycin	140044203	1
Caelo	Erythromycin	140440006	1
Anzag	Erythromycin	14044001	1
Fagron	Erythromycin	14044001	1
Caelo	Erythromycin	14044002	12

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Supplier	Substance	Batch	Spectra
AHD 02.02.15 EK 20,08	Erythromycin	14044002	1
Caelo	Erythromycin	14044004	11
Caelo	Erythromycin	14044005	8
Caelo	Erythromycin	140440044	1
Caelo	Erythromycin	14044006	6
Noweda	Erythromycin	14044006	1
Eigenherstellung	Erythromycin	14044006	1
Caelo	Erythromycin	14044007	5
Caelo	Erythromycin	14044008	6
Caelo	Erythromycin	14044009	1
Caelo	Erythromycin	14044010	7
Caelo	Erythromycin	14044011	1
Caelo	Erythromycin	14044012	1
Caelo	Erythromycin	14044014	4
Caelo	Erythromycin	1404409	1
Caelo	Erythromycin	14044101	7
Caelo	Erythromycin	14044105	3
Phoenix	Erythromycin	14044106	1
Caelo	Erythromycin	14044106	1
Caelo	Erythromycin	14044107	2
Caelo	Erythromycin	14044108	1
Caelo	Erythromycin	14044109	4
Caelo	Erythromycin	14044110	2
Noweda21.04.2015	Erythromycin	14044110	1
Caelo	Erythromycin	14044114	6
Noweda	Erythromycin	14044114	1
Caelo	Erythromycin	14044115	5
Caelo	Erythromycin	14044118	3
Caelo	Erythromycin	14044201	5
Caelo	Erythromycin	1404418	1
Phönix	Erythromycin	14044201	1
Caelo	Erythromycin	14044202	3
Caelo	Erythromycin	14044205	6
Euro OTC	Erythromycin	14044205	1
Caelo	Erythromycin	14044206	3
Caelo	Erythromycin	14044207	5
Euro OTC	Erythromycin	140901901	5
Euro OTC	Erythromycin	1409019-01	21
OTG/Gehe	Erythromycin	1409019-01	1
Phoenix goettin	Erythromycin	1409019-01	1
Caelo	Erythromycin	1409019-01	2
Euro OTC	Erythromycin	1409019-01Mg100g	1
Euro OTC	Erythromycin	1409019-02	37
Euro OTC	Erythromycin	140901902	1
Caelo	Erythromycin	1409019-02	2
EurPS	Erythromycin	1409019-02	3
Fagron	Erythromycin	1409019-02	2
EuroTOC / Noweda	Erythromycin	1409019-02	1
Caelo	Erythromycin	140901902	2
Unisan	Erythromycin	140901902	1
Caelo	Erythromycin	1414M-01362	1
Euro OTC	Erythromycin	14090-9-01	1
Euro OTC	Erythromycin	140919-02	1
Caelo	Erythromycin	1430b01300059	1
Fagron	Erythromycin	1430-b01-300060	1
Fagron	Erythromycin	1430B01303884	1
Fagron	Erythromycin	1430-B01-308789	1
Fagron	Erythromycin	14B06-35-290873	1
Fagron	Erythromycin	14B06-B35	12
Phönix	Erythromycin	14B06-B35	1

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Supplier	Substance	Batch	Spectra
Caelo	Erythromycin	14B06-B35	2
Caelo	Erythromycin	14B06-B35-290866	2
Fagron	Erythromycin	14B06-B35-290866	2
Fagron	Erythromycin	14B06-B35-290872	8
Caelo	Erythromycin	14B06-B35-290872	2
Fagron	Erythromycin	14b06-b35-290872	1
Fagron	Erythromycin	14B06-B35-290873	4
Caelo	Erythromycin	14B06-B35-290873	1
Fagron	Erythromycin	14B06-B35290873	1
Bombastus	Erythromycin	14B06-B35-290873	1
Fagron	Erythromycin	14B06-B35-290874	4
Fagron	Erythromycin	14B06-B35-290875	8
Fagron	Erythromycin	14B06-B35-293508	2
Caelo	Erythromycin	14b06-b35-293508	1
Noweda/Gehe	Erythromycin	14B06-B35-293508	1
Fagron	Erythromycin	14B06-B35-293509	7
Fagron	Erythromycin	14b06-b35-293509	1
Fagron	Erythromycin	14B06-B35-293510	1
Fagron	Erythromycin	14Bo6-B35	1
Fagron	Erythromycin	14F13-B02	2
Bombastus	Erythromycin	14F13-B02	1
Fagron	Erythromycin	14F13-B02-293487	1
Fagron	Erythromycin	14F13-B02-293488	2
Fagron	Erythromycin	14F13-B02-293490	2
Fagron	Erythromycin	14F13-B02-293511	3
Fagron	Erythromycin	14F13-B02-296464	2
Caelo	Erythromycin	14F13-B02-296464	2
Fagron	Erythromycin	14F13-B02-300061	3
Fagron	Erythromycin	14F13-B12-300061	1
Fagron	Erythromycin	14I30-B01	9
Caelo	Erythromycin	14I30-B01	1
Fagron	Erythromycin	14I30B01	1
Fagron	Erythromycin	14I30-B01-3000060	1
Fagron	Erythromycin	14I30-B01-300050	2
Fagron	Erythromycin	14i30b01-300059	1
Fagron	Erythromycin	14I30-B01-300062	2
Fagron	Erythromycin	14I30-B01-300060	1
Fagron	Erythromycin	14I30-B01-303884	6
Fagron	Erythromycin	14I30-B01-300063	1
Fagron	Erythromycin	14i30-b01-303884	1
Fagron	Erythromycin	14I30-B01-306927	3
Fagron	Erythromycin	14I30-B01-308188	4
Fagron	Erythromycin	14I30-B01-308189	1
Fagron	Erythromycin	14I30B01308189	1
Fagron	Erythromycin	14I30-B01-308789	1
AHD 26.02.16 13,15EUR	Erythromycin	14I30-B01-308789	1
Fagron	Erythromycin	14I30-B01-311166	2
Fagron	Erythromycin	14i30-b01-311166	1
Caelo	Erythromycin	15042601	4
Caelo	Erythromycin	15042602	6
Caelo	Erythromycin	15042603	5
caesar&loretz,phönix	Erythromycin	15042603	1
Bombastus	Erythromycin	15042603	1
Caelo	Erythromycin	15042604	3
Calo/AHD	Erythromycin	15042605	1
Caelo	Erythromycin	15042605	5
Caelo	Erythromycin	15042606	1
Caelo	Erythromycin	15042608	2
Caelo	Erythromycin	15042609	7
Phoenix	Erythromycin	15042609	1

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Supplier	Substance	Batch	Spectra
Caelo	Erythromycin	15042610	6
Caesar&Loretz GmbH /Anzag	Erythromycin	15042610	1
Caelo	Erythromycin	15042611	3
phönix	Erythromycin	15042611	1
Caelo	Erythromycin	15042612	5
Caelo	Erythromycin	15042613	4
Caelo	Erythromycin	15042701	6
Caelo	Erythromycin	15042702	5
Caelo	Erythromycin	15042703	8
Caelo	Erythromycin	15042704	9
Caelo	Erythromycin	15042705	12
Caelo	Erythromycin	15042706	4
Caelo	Erythromycin	15042707	1
Caelo	Erythromycin	15042708	1
Caelo	Erythromycin	15042711	7
Caelo	Erythromycin	15042802	1
Caelo	Erythromycin	15042803	10
Rondell Apotheke	Erythromycin	15042803	1
Caelo	Erythromycin	15042804	1
Caelo	Erythromycin	15042806	11
Caelo	Erythromycin	15042808	1
Caesar&Loretz GmbH	Erythromycin	15042807	1
Caelo	Erythromycin	15042809	2
Euro OTC	Erythromycin	15042810	1
Caelo	Erythromycin	15042810	1
Phoenix	Erythromycin	15042811	1
Caelo	Erythromycin	15042811	1
Caelo	Erythromycin	15042812	1
Caelo	Erythromycin	15042813	7
phönix	Erythromycin	15042813	1
Caelo	Erythromycin	15042814	3
Caesar & Loretz/AHC	Erythromycin	15042813	1
Caesar & Loretz GmbH	Erythromycin	15042814	1
Caelo	Erythromycin	15042815	3
Caelo	Erythromycin	15042901	6
Caelo	Erythromycin	15042902	2
Euro OTC	Erythromycin	15080-01	1
Euro OTC	Erythromycin	1508034	1
Euro OTC	Erythromycin	1508034-01	31
Euro/Gehe	Erythromycin	1508034-01	1
Euro OTC	Erythromycin	150803401	1
Caelo	Erythromycin	1508034-01	2
Fagron	Erythromycin	1508034-01	1
Caelo	Erythromycin	150803401	1
Noweda	Erythromycin	150803401	1
Euro OTC	Erythromycin	1508034-02	10
Caelo	Erythromycin	1508034-02	1
Euro OTC	Erythromycin	1508034-02Mg100g	1
Caelo	Erythromycin	1524004	1
Caelo	Erythromycin	15245002	10
Caelo	Erythromycin	15245003	7
Caelo	Erythromycin	15245004	9
EuRho/Sanacorp	Erythromycin	15245004	1
Wolff/AHD	Erythromycin	15245004	1
Gehe	Erythromycin	15245004	1
Caelo	Erythromycin	15245005	1
Caelo	Erythromycin	15245007	1
Caelo	Erythromycin	15245008	1
Noweda	Erythromycin	15245101	1
Caelo	Erythromycin	15245101	8

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Supplier	Substance	Batch	Spectra
phönix	Erythromycin	15245101	1
Caelo	Erythromycin	154042602	1
Fagron	Erythromycin	15G07-B05-312356	2
Fagron	Erythromycin	16/24-B10-329158	1
Jenapharm/Phönix	Erythromycin	1607036-01	1
Euro OTC	Erythromycin	1607038-01	32
Caelo	Erythromycin	160703801	1
Euro OTC	Erythromycin	160703801	2
VDL	Erythromycin	160703801	1
Biomed/Phönix	Erythromycin	1607038-01	1
Euro OTC	Erythromycin	1607038-02	13
Caelo	Erythromycin	1607038-02	3
Gehe	Erythromycin	1607038-02	1
Euro OTC	Erythromycin	160703802	2
Noweda	Erythromycin	1607038-02	1
gehe	Erythromycin	1607038-02	2
Caelo	Erythromycin	16079201	4
Caelo	Erythromycin	16079202	5
Caelo	Erythromycin	16079203	11
Caelo	Erythromycin	16079204	4
Gehe	Erythromycin	16079204	1
Phönix	Erythromycin	16079205	1
Caelo	Erythromycin	16079205	4
Caelo	Erythromycin	16079206	2
Alte Apotheke	Erythromycin	16079206	1
Caelo	Erythromycin	16079207	1
Caelo	Erythromycin	16079208	2
Caesar & Loretz GmbH, P…	Erythromycin	16079207	1
Gehe	Erythromycin	16079209	1
Fagron	Erythromycin	16079208	1
Caelo	Erythromycin	16079210	4
Caelo	Erythromycin	16079213	7
Caelo	Erythromycin	16079214	5
Caelo	Erythromycin	16079216	4
Caelo	Erythromycin	16079501	3
Caelo	Erythromycin	16079502	2
Phoenix	Erythromycin	16079501	1
Caelo	Erythromycin	16079503	3
Caelo	Erythromycin	16079510	2
Caelo	Erythromycin	16079506	1
Gehe	Erythromycin	16079510	1
Caelo	Erythromycin	16079513	3
Caelo	Erythromycin	16079511	1
Caelo	Erythromycin	16079602	1
Allianz Healthcare	Erythromycin	16079602	1
Caelo	Erythromycin	16079605	1
Caelo	Erythromycin	16079606	2
Bombastus	Erythromycin	16079606	1
Caelo	Erythromycin	16079607	1
Caelo	Erythromycin	16079608	3
Caelo	Erythromycin	16079612	1
Caelo	Erythromycin	16079702	1
Caelo	Erythromycin	16079704	1
Euro OTC	Erythromycin	167038-01	1
Caelo	Erythromycin	16979201	1
Fagron	Erythromycin	16G06-B03	3
Fagron	Erythromycin	16G06-B03-324463	5
Fagron	Erythromycin	16G06-B030003	1
Fagron	Erythromycin	16g06-b03-324463	1
Fagron	Erythromycin	16G06-B03-324464	7

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Supplier	Substance	Batch	Spectra
Fagron	Erythromycin	16G06-B03-324465	2
Fagron	Erythromycin	16G06-B03-324466	2
Fagron	Erythromycin	16G06-B03-329150	1
Fagron	Erythromycin	16G06B03-329149	1
Fagron	Erythromycin	16J24-B10-329154	1
Fagron	Erythromycin	16J24-B10-329156	1
Caelo	Erythromycin	1705038	1
Euro OTC	Erythromycin	1705038-01	4
Caelo	Erythromycin	17088002	1
Caelo	Erythromycin	17088003	1
Noweda	Erythromycin	17088003	1
Caelo	Erythromycin	17088004	1
Caelo	Erythromycin	17088007	1
Caelo	Erythromycin	17088008	1
Caelo	Erythromycin	17088010	1
Caelo	Erythromycin	24071402	1
Caelo	Erythromycin	28041505	1
Caelo	Erythromycin	28101405	1
Fagron	Erythromycin	3000-50	1
Caelo	Erythromycin	30011505	1
Caelo	Erythromycin	5042604	1
Sanacorp	Erythromycin	59/AKD51	1
Caelo	Erythromycin	60/AKD4	1
Sanacorp	Erythromycin	60/AKD52	1
Sanacorp	Erythromycin		1
Caelo	Erythromycin	EB06/14	1
Fagron	Erythromycin	EB022E14	3
Fagron	Erythromycin	EB032J13	4
Fagron	Erythromycin	EB06814	1
Fagron	Erythromycin	EB068/14	1
Klenk	Erythromycin	EB068I14	1
Euro OTC	Erythromycin	EBS/1307-BM-001	1
Fagron	Erythromycin	OEBA/0010516	2
Euro OTC	Erythromycin	EBS/1408-BM-001	1
Caelo	Erythromycin	eb078b13	1
Caelo	Erythromycin	511111	1
Fagron	Erythromycin	510211362	1
Euro OTC	Erythromycin	80616-4	1
Caelo	Erythromycin	10006206	1
Caelo	Erythromycin	1008018-02	1
Euro OTC	Erythromycin	1013u-01362	1
Caelo	Erythromycin	1021703	1
Caelo	Erythromycin	10217101	1
Caelo	Erythromycin	10217102	1
Caelo	Erythromycin	10217103	1
Caelo	Erythromycin	10217105	1
Caelo	Erythromycin	10217106	1
Caelo	Erythromycin	10217107	1
Caelo	Erythromycin	10217204	1
Caesar & Loretz GmbH, 4...	Erythromycin	10217208	1
Caelo	Erythromycin	10217412	1
Caelo	Erythromycin	10217501	1
Fagron	Erythromycin	11/06-N05	1
Erika apotheke	Erythromycin	11/06-N05	1
Euro OTC	Erythromycin	1106036-04	2
Phönix Gotha	Erythromycin	1106036-04	1
Sanacorp	Erythromycin	1106036-04	1
Euro OTC	Erythromycin	1106036-05	6
Phönix Gotha	Erythromycin	1106036-05	1
Fagron	Erythromycin	1106036-05	3

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Supplier	Substance	Batch	Spectra
Europharm/Otto	Erythromycin	1106036-05	2
Gehe	Erythromycin	1106036-05	1
EuRho/Phönix	Erythromycin	1106036-05	1
Caelo	Erythromycin	11195302	2
Caelo	Erythromycin	1114Q-01362	1
Phönix 30.08.2012	Erythromycin	11195305	1
Caelo	Erythromycin	11195306	1
Caelo	Erythromycin	11195404	2
Caelo	Erythromycin	11195405	3
Caelo	Erythromycin	11195406	1
Caelo	Erythromycin	11195407	4
VDL	Erythromycin	11195407	1
Caelo	Erythromycin	11195408	1
Noweda	Erythromycin	11195411	2
Gehe	Erythromycin	11195412	1
Noweda	Erythromycin	11195413	1
Caelo	Erythromycin	11195412	1
Phoenix, 13.09.2012	Erythromycin	1195305	1
Caelo	Erythromycin	1195306	1
Caelo	Erythromycin	1195407	1
Gehe	Erythromycin	11D13-N09	1
Fagron	Erythromycin	11J06-N05	3
Caelo	Erythromycin	11j06-n05	1
Fagron	Erythromycin	11j06-n05	1
Post-Apotheke	Erythromycin	11J06-N05	3
Phönix Gotha	Erythromycin	11J06-N05	1
Fagron	Erythromycin	11J06-No5	1
ANZAG am 16.05.2012	Erythromycin	11J06-NO5	1
Phytocomm	Erythromycin	1203ery	1
Anzag 23.11.12 ek:26,49	Erythromycin	1205035-01	1
EuRho/Phönix	Erythromycin	1205035	1
Euro OTC	Erythromycin	1205035-01	15
EuRho	Erythromycin	1205035-01	1
Fagron	Erythromycin	1205035-01	1
Phönix	Erythromycin	120503501	1
Euro OTC	Erythromycin	1205035-02	21
Caelo	Erythromycin	120503502	1
Sanacorp	Erythromycin	1205035-02	1
Alliance Health	Erythromycin	120503502	1
EuRho	Erythromycin	1205035-02	1
Euro OTC	Erythromycin	120503502	1
Euro OTC	Erythromycin	1205036/02	1
Euro OTC	Erythromycin	1205036-01	7
Caelo	Erythromycin	1205036-01	2
Euro OTC	Erythromycin	120503601	1
Fagron	Erythromycin	1205036-01	1
EuRho	Erythromycin	1205036-01	1
Euro OTC	Erythromycin	1205036-02	12
Phönix 11.11.2013	Erythromycin	1205036-02	1
Euro OTC	Erythromycin	120503602	2
phönix	Erythromycin	1205036-02	1
Phönix	Erythromycin	1205036-02	1
Caelo	Erythromycin	12152101	3
Caelo	Erythromycin	12152102	3
Caelo	Erythromycin	12152103	3
Gehe	Erythromycin	12152103	1
Caelo	Erythromycin	12152104	5
Gehe	Erythromycin	12152104	1
Caelo	Erythromycin	12152105	6
Gehe	Erythromycin	12152105	1

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Supplier	Substance	Batch	Spectra
Caelo	Erythromycin	12152107	1
Noweda	Erythromycin	12152108	2
Caelo	Erythromycin	12152108	5
Caelo	Erythromycin	12152109	11
Caelo	Erythromycin	1215219	1
Noweda	Erythromycin	12152201	1
Caelo	Erythromycin	12152201	8
Phoenix	Erythromycin	12152201	2
Caelo	Erythromycin	12152202	4
Sanacorp	Erythromycin	12152202	1
Caelo	Erythromycin	12152203	1
Caelo	Erythromycin	12152205	11
Gehe 20.03.2013	Erythromycin	12152205	1
Caelo	Erythromycin	12152206	11
Caelo	Erythromycin	12152208	4
Fagron	Erythromycin	12152209	1
Caelo	Erythromycin	12156201	3
AHD, 11.09.2013	Erythromycin	12152210	1
Caelo	Erythromycin	12156202	8
Caelo	Erythromycin	12156203	2
Caelo	Erythromycin	12156204	4
Caelo	Erythromycin	12156207	4
AHC 04.07.13 EK38,50	Erythromycin	12156207	1
Sanacorp	Erythromycin	12156208	1
Fagron	Erythromycin	12e24-n04	1
Fagron	Erythromycin	12E24-N04	19
Noweda	Erythromycin	12E24-N04	2
Gehe	Erythromycin	12E24-N04	1
Anzag	Erythromycin	12e24-n04	1
Großhandel	Erythromycin	12E24-N04	1
Caelo	Erythromycin	12E24-N04	2
Alliance Healthcare	Erythromycin	12E24-N04	1
Fagron	Erythromycin	12E24-No4	1
Fagron	Erythromycin	12J30-N01	13
Fagron	Erythromycin	12J30N01	1
Fagron	Erythromycin	12J30-NO1	1
Phönix 27.04.2013	Erythromycin	12J30-N01	1
Euro	Erythromycin	1308016-02	1
Caelo	Erythromycin	13145504	1
Caelo	Erythromycin	1315501	1
Caelo	Erythromycin	13175501	6
gepepharm GmbH	Erythromycin	13175502	1
Fagron	Erythromycin	13175503	1
Anzag	Erythromycin	13175506	1
Caelo	Erythromycin	131756017	1
Caesar&loretz,Phoenix	Erythromycin	13175602	1
Noweda	Erythromycin	13175603	2
Caelo	Erythromycin	13175603	9
Euro CT Phönix	Erythromycin	13175604	1
Phoenix	Erythromycin	13175608	1
Caelo	Erythromycin	13175612	1
Fagron	Erythromycin	13175803	1
Caelo	Erythromycin	13189001	8
Gehe	Erythromycin	13189001	2
Caesar & Loretz GmbH, 4...	Erythromycin	13189002	1
Caelo	Erythromycin	13189002	7
gehe 24.8.13	Erythromycin	13189002	1
Gehe	Erythromycin	13189004	1
Caelo	Erythromycin	13189004	5
Caelo	Erythromycin	13189006	3

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Supplier	Substance	Batch	Spectra
Caelo	Erythromycin	13189007	1
Fagron	Erythromycin	13A02-N06	9
Caeolo/Noweda	Erythromycin	13189007	1
Caelo	Erythromycin	13A02-N06	1
Caelo	Erythromycin	132152108	1
Fagron	Erythromycin	13A02N06	1
post apotheke	Erythromycin	13A02-N06	1
Phönix, 28.10.2013	Erythromycin	13A02-N06	1
Fagron	Erythromycin	13A02-N-06	1
fagr	Erythromycin	13A02-N06	1
Fagron	Erythromycin	13A02-N060571/680	1
Fagron	Erythromycin	13A02-No6	1
Fagron	Erythromycin	13D30-N01003/456	1
Fagron	Erythromycin	13D30-N010336/730	1
Fagron	Erythromycin	13d30-n01	2
GEHE	Erythromycin	13D30-N01	1
Fagron	Erythromycin	13d30-N01	1
AHD, 25.07.2013	Erythromycin	13D30-N01	1
Fagron	Erythromycin	13D30N01	1
Fagron	Erythromycin	13D30-N010278/730	1
AHD, 25.11.13	Erythromycin	13F12-N21	1
Alliance Healthcare	Erythromycin	13F12-N21	1
Gehe	Erythromycin	13F12-N21	1
Fagron	Erythromycin	13H22-N070126/246	1
Sanacorp	Erythromycin	13H22-N07	1
Caesar&loretz,Phoenix	Erythromycin	14044004	1
Caelo	Erythromycin	1404414	1
Euro OT	Erythromycin	1409019-02	1
EuRho/Noweda	Erythromycin	1508034-02	1
Caelo	Erythromycin	19071306	1
Caelo	Erythromycin	16071302	1
Caelo	Erythromycin	20122013D	1
Caelo	Erythromycin	22041302	1
Caelo	Erythromycin	24101312	1
Caelo	Erythromycin	20270912-3	1
Caelo	Erythromycin	26011402	1
Caelo	Erythromycin	25011304	1
Caelo	Erythromycin	26101204	1
Caelo	Erythromycin	27071202	1
Caelo	Erythromycin	27131-01362	1
Caelo	Erythromycin	3110195	1
Euro OTC	Erythromycin	3613A1362	1
Euro OTC	Erythromycin	4112Q-01362	1
Fagron	Erythromycin	4212E-01362	1
Caelo	Erythromycin	59/AKD59	1
Euro OTC	Erythromycin	700770	1
Fagron	Erythromycin	E-030613-1	1
Fagron	Erythromycin	E-250213-2	1
Fagron	Erythromycin	EB048G12	1
Fagron	Erythromycin	EB078B13	1
Fagron	Erythromycin	EBS/1201-008	2
Euro OTC	Erythromycin	EBS/1205-M-041	1
Euro OTC	Erythromycin	EBS/1205-M-040	1
Fagron	Erythromycin	11195302	1
Phagron	Erythromycin		1
Caelo	Erythromycin	11195411	1
Symbiotica	Erythromycin	12152201	1
Anzag	Erythromycin	12152206	1
Euro OTC	Erythromycin	12A02-N06	1
Caelo	Erythromycin	13175504-3413310132	1

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Caelo	Erythromycin	13175506-3559412014	1
AHD	Erythromycin	13189002	1

- 75 536 spectra from 463 *Apo-Ident* customers from a total of 25 152 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Erythromycin* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Erythromycin* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	320	0	72 113
Type B	0	536	27	161 510
Type C	0	1570	53	75 536

The substance/substance group *Erythromycin* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9887 %)	100.0000 % (> 98.1250 %)
Type B	100.0000 % (> 99.9928 %)	95.2043 % (> 94.6714 %)
Type C	100.0000 % (> 99.8849 %)	96.7344 % (> 96.5496 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21056	21890	6.64	39.95
21323	21890	4.75	39.50

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Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21651	21651	0.00	35.32
21669	21651	10.57	37.96
21890	21890	0.00	39.95
22438	22438	0.00	40.11
22832	22832	0.00	38.29
23438	23438	0.00	36.03

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Estradiol benzoate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20098-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Estradiol benzoate; Estradioli benzoas; Oestradiolum benzoicum

Special notes

When selecting the *Estradiol benzoate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Estradiol benzoate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Estradiol benzoate	12H02-N02	20889	40	20120817
Fagron	Estradiol benzoate	14B20-B02	21257	40	20140327
Euro OTC	Estradiol benzoate	1301006-02	21290	40	1507405
Euro OTC	Estradiol benzoate	1507009	21869	40	0000010566
Caelo	Estradiol benzoate	15078608	23218	40	20150415

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Estradiol benzoate	12H02-N02	20889SI	40	20120817
Fagron	Estradiol benzoate	14B20-B02	21257SI	40	20140327
Euro OTC	Estradiol benzoate	1507009	21869SI	40	0000010566

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 320 spectra of 8 reference samples from the substance/substance group *Estradiol benzoate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 5 different batches.

- 72 113 spectra from a total of 1577 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 240 spectra from 8 reference samples of the substance/substance group *Estradiol benzoate*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Estradiol benzoate	13277607	21324	40
Euro OTC	Estradiol benzoate	1507009	21869†	20
Euro OTC	Estradiol benzoate	1611004	22873	40
Fagron	Estradiol benzoate	12H02-N02	20889SI†	20
Fagron	Estradiol benzoate	14B20-B02	21257SI†	20
Euro OTC	Estradiol benzoate	1507009	21869SI†	20
Euro OTC	Estradiol benzoate	1611004	22873SI	40
Caelo	Estradiol benzoate	15078608	23218SI	40

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*).

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- 161 833 spectra from a total of 3493 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 280 spectra from 165 *Apo-Ident* customers from 77 batches from the substance/substance group *Estradiol benzoate*.

- These include spectra of independent samples from 70 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Estradiol benzoate	1149	1
Euro OTC	Estradiol benzoate	1201019-01	7
Caelo	Estradiol benzoate	1201019-02	1
Fagron	Estradiol benzoate	12D20N06	1
Fagron	Estradiol benzoate	12h02n02	1
Euro OTC	Estradiol benzoate	1301006-02	8
Caelo	Estradiol benzoate	13276401	6
Caelo	Estradiol benzoate	13277605	5
Euro OTC	Estradiol benzoate	1401001-01	10
Caelo	Estradiol benzoate	13277607	3
Euro OTC	Estradiol benzoate	14010001-01	1
Fagron	Estradiol benzoate	13C15-B07-288645	1
Caelo	Estradiol benzoate	1401001-01	1
Euro OTC	Estradiol benzoate	140101-01	1
Euro OTC	Estradiol benzoate	1412033-01	8
Fagron	Estradiol benzoate	1412033-01	1
Fagron	Estradiol benzoate	14B20-B02	3
Fagron	Estradiol benzoate	14B20-B02-2920001	1
Fagron	Estradiol benzoate	14B20-B02-292001	4
AHD	Estradiol benzoate	14B20-B02-292001	1
Fagron	Estradiol benzoate	14B20-B02-294949	5
Caelo	Estradiol benzoate	14B20-B02-294949	1
phönix	Estradiol benzoate	14B20-B02-294949	1
Fagron	Estradiol benzoate	14b20-b02-294949	1
Euro OTC	Estradiol benzoate	1507009-01	11
Euro OTC	Estradiol benzoate	150700901	2
Caelo	Estradiol benzoate	15078602	6
Caelo	Estradiol benzoate	15078603	12
Caelo	Estradiol benzoate	15078604	9
sanacorp	Estradiol benzoate	15078604	2
Caelo	Estradiol benzoate	15078606	3
Gehe	Estradiol benzoate	15078606	1
Caelo	Estradiol benzoate	15078608	4
Fagron	Estradiol benzoate	15C10-B04-305523	8
Fagron	Estradiol benzoate	15c10-b04-305523	1
Caelo	Estradiol benzoate	15c10-b04-305523	1

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Hence, these spectra are not independent and are not of *Type B*.

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Supplier	Substance	Batch	Spectra
Caelo	Estradiol benzoate	15C10B04305523	1
Caelo	Estradiol benzoate	15C10-B04-305523	2
Fagron	Estradiol benzoate	15E08-B08-311705	7
Caelo	Estradiol benzoate	16003701	1
Phönix	Estradiol benzoate	16003707	1
Caelo	Estradiol benzoate	16003707	1
Fagron	Estradiol benzoate	83101340	5
Euro OTC	Estradiol benzoate	83101340	1
Euro OTC	Estradiol benzoate	84303830	1
Caelo	Estradiol benzoate	84303830	1
Fagron	Estradiol benzoate	84303830	2
Caelo	Estradiol benzoate	6091305	1
Caelo	Estradiol benzoate		4
Euro OTC	Estradiol benzoate	8011422	1
Sanacorp	Estradiol benzoate	10/AKD24	1
Finze	Estradiol benzoate	1003040-01	2
euroho/gehe	Estradiol benzoate	1007037-02	1
Euro OTC	Estradiol benzoate	1007037-02	1
Bayer-Schering	Estradiol benzoate	1007037-03	1
aliance healthcare 5.12...	Estradiol benzoate	10118576	1
Caelo	Estradiol benzoate	10124909	4
Caesar	Estradiol benzoate	10124912	1
Caelo	Estradiol benzoate	10124912	1
Caelo	Estradiol benzoate	10124913	1
v.d.l	Estradiol benzoate	10124913	1
Caelo	Estradiol benzoate	10124918	2
Caelo	Estradiol benzoate	10124915	2
Caelo	Estradiol benzoate	10124919	1
Caelo	Estradiol benzoate	10124921	3
Caelo	Estradiol benzoate	11L23-N01	1
Gehe	Estradiol benzoate	11L23-N01	1
Fagron	Estradiol benzoate	11L23-N01	1
Euro OTC	Estradiol benzoate	1201019-02	12
A.H. 07.06.13 ek: 24,14EUR	Estradiol benzoate	1201019-02	1
Phönix	Estradiol benzoate	1201019-02	1
EuRho/Sanacorp	Estradiol benzoate	1201019-02	1
Euro OTC	Estradiol benzoate	121019-01	1
Caelo	Estradiol benzoate	12255903	2
Fagron	Estradiol benzoate	12255903	1
Caelo	Estradiol benzoate	12255904	15
Caelo	Estradiol benzoate	12255905	15
GEHE	Estradiol benzoate	12H02-N02	1
Fagron	Estradiol benzoate	12H02-N02	4
Fagron	Estradiol benzoate	12h02-n02	2
Fagron	Estradiol benzoate	12H02-N052	1
Fagron	Estradiol benzoate	12L14-N02	1
Fagron	Estradiol benzoate	13/11-N01	2
Euro OTC	Estradiol benzoate	1301006-01	2
Euro OTC	Estradiol benzoate	130100601	1
Alliance Healthcare	Estradiol benzoate	1301006-01	1
Caelo	Estradiol benzoate	13277602	9
Noweda	Estradiol benzoate	13277603	1
Caelo	Estradiol benzoate	13277603	2
Fagron	Estradiol benzoate	13C15-B07-288646	1
Fagron	Estradiol benzoate	13I11-N01	1
Fagron	Estradiol benzoate	13I11N01	1
Caelo	Estradiol benzoate	2021211-1	1
Caelo	Estradiol benzoate	21121204	1
Fagron	Estradiol benzoate	2x12L14-N02	1
Fagron	Estradiol benzoate	81403680	1

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Supplier	Substance	Batch	Spectra
Fagron	Estradiol benzoate	81403700	1
Fagron	Estradiol benzoate	81403690	1
Caelo	Estradiol benzoate	81403700	1
Caelo	Estradiol benzoate	92137389	1
VDL	Estradiol benzoate	1507009-01	1
Gehe	Estradiol benzoate	10124913	1
GEHE	Estradiol benzoate	12B08-N05	1
Caelo	Estradiol benzoate	1301006-02	1
VDl 16.10.14 12,70 euro	Estradiol benzoate		1

- 76 879 spectra from 463 *Apo-Ident* customers from a total of 25 471 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Estradiol benzoate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Estradiol benzoate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	320	0	72 113
Type B	0	240	0	161 833
Type C	0	253	27	76 879

The substance/substance group *Estradiol benzoate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9887 %)	100.0000 % (> 98.1250 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 97.5000 %)
Type C	100.0000 % (> 99.8850 %)	90.3571 % (> 89.2857 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20889	21290	3.98	65.82
21257	21290	1.01	65.95
21290	21290	0.00	66.87
21869	21869	0.00	69.46
23218	21869	9.65	65.56

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Estradiol hemihydrate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20497-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Estradiol hemihydrate; Estradiolum hemihydricum; Oestradiolum hemihydricum

Special notes

When selecting the *Estradiol hemihydrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Estradiol hemihydrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Estradiol hemihy…	1208022-01	21291	40	20121012
Caelo	Estradiol hemihy…	12268016	21302	40	1410502
Caelo	Estradiol hemihy…	13285802	21508	40	1410504
Fagron	Estradiol hemihy…	14G24-B04-297404	21667	40	20140825
Euro OTC	Estradiol hemihy…	1507013	21847	40	1510623

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Estradiol hemihy…	1510039	21945	40	20151103*
Euro OTC	Estradiol hemihy…	1601017	22307	30	20160122*
Euro OTC	Estradiol hemihy…	1612008	22913	40	20170117*
Fagron	Estradiol hemihy…	16H04-B01-328738	23184	40	20160915
Euro OTC	Estradiol hemihy…	1507013	21847SI	40	1510623
Euro OTC	Estradiol hemihy…	1510039	21945SI	69	20151103*
Euro OTC	Estradiol hemihy…	1612008	22913SI	40	20170117*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 499 spectra of 12 reference samples from the substance/substance group *Estradiol hemihydrate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 9 different batches.

- 71 934 spectra from a total of 1573 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 1365 spectra from 44 reference samples of the substance/substance group *Estradiol hemihydrate*.

- These include spectra of independent samples from 10 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Estradiol hemihydrate	11H23-N02	20497	40

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*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Estradiol hemihydrate	11078109	20503	40
Fagron	Estradiol hemihydrate	13K22-N01	21263	40
Caelo	Estradiol hemihydrate	13285802	21499	60
Caelo	Estradiol hemihydrate	13285802	21500	60
Caelo	Estradiol hemihydrate	13285802	21501	20
Caelo	Estradiol hemihydrate	13285802	21502	20
Caelo	Estradiol hemihydrate	13285802	21503	20
Caelo	Estradiol hemihydrate	13285802	21504	20
Caelo	Estradiol hemihydrate	13285802	21505	20
Caelo	Estradiol hemihydrate	13285802	21506	20
Caelo	Estradiol hemihydrate	13285802	21507	20
Caelo	Estradiol hemihydrate	13285802	21508†	20
Fagron	Estradiol hemihydrate	14G24-B04-297404	21667†	15
Euro OTC	Estradiol hemihydrate	1507013	21847†	20
Euro OTC	Estradiol hemihydrate	1510039	21945†	20
Euro OTC	Estradiol hemihydrate	1601017	22307†	15
Euro OTC	Estradiol hemihydrate	1607003	22712	40
Euro OTC	Estradiol hemihydrate	1612008-01	23099	40
Caelo	Estradiol hemihydrate	170582	23339	40
Euro OTC	Estradiol hemihydrate	1705018	23431	30
Euro OTC	Estradiol hemihydrate	1710031	23779	40
Euro OTC	Estradiol hemihydrate	1802013	24083	40
Euro OTC	Estradiol hemihydrate	1802012	24086	40
Caelo	Estradiol hemihydrate	13285802	21499SI	60
Caelo	Estradiol hemihydrate	13285802	21500SI	60
Caelo	Estradiol hemihydrate	13285802	21501SI	20
Caelo	Estradiol hemihydrate	13285802	21502SI	20
Caelo	Estradiol hemihydrate	13285802	21503SI	20
Caelo	Estradiol hemihydrate	13285802	21504SI	20
Caelo	Estradiol hemihydrate	13285802	21505SI	20
Caelo	Estradiol hemihydrate	13285802	21506SI	20
Caelo	Estradiol hemihydrate	13285802	21507SI	20
Euro OTC	Estradiol hemihydrate	1507013	21847SI†	20
Euro OTC	Estradiol hemihydrate	1510039	21945SI†	20
Euro OTC	Estradiol hemihydrate	1601017	22307SI	45
Euro OTC	Estradiol hemihydrate	1607003	22712SI	40
Euro OTC	Estradiol hemihydrate	1612008-01	23099SI	30
Fagron	Estradiol hemihydrate	16H04-B01-328738	23184SI	30
Caelo	Estradiol hemihydrate	170582	23339SI	30
Euro OTC	Estradiol hemihydrate	1705018	23431SI	30
Euro OTC	Estradiol hemihydrate	1710031	23779SI	40
Euro OTC	Estradiol hemihydrate	1802013	24083SI	40
Euro OTC	Estradiol hemihydrate	1802012	24086SI	40

- 160 708 spectra from a total of 3483 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

- 118 spectra from 75 *Apo-Ident* customers from 60 batches from the substance/substance group *Estradiol hemihydrate*.

- These include spectra of independent samples from 58 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Estradiol hemihydrate	11078105	1
Euro OTC	Estradiol hemihydrate	120802201	1
Fagron	Estradiol hemihydrate	11A21-N01	1
Caelo	Estradiol hemihydrate	12268012	5
Fagron	Estradiol hemihydrate	12268011	2
Euro OTC	Estradiol hemihydrate	1308003-01	2
Caelo	Estradiol hemihydrate	13285802	5
phönix	Estradiol hemihydrate	13285802	1
Caelo	Estradiol hemihydrate	13285811	3
Fagron	Estradiol hemihydrate	13E07-N02	3
Fagron	Estradiol hemihydrate	13K22-N01	7
Bayer Pharma	Estradiol hemihydrate	13K22-N01	2
Fagron	Estradiol hemihydrate	13K22N01	1
Fagron	Estradiol hemihydrate	13k22n01	1
Euro OTC	Estradiol hemihydrate	1404030-01	1
Euro OTC	Estradiol hemihydrate	1411024-01	2
Euro OTC	Estradiol hemihydrate	14G24-B04-297402	1
Fagron	Estradiol hemihydrate	14G24-B04-297402	3
Fagron	Estradiol hemihydrate	14G24-B04-297404	2
Fagron	Estradiol hemihydrate	14G24-B04-297406	1
Fagron	Estradiol hemihydrate	14G24-B04-297405	1
Fagron	Estradiol hemihydrate	14G24-B04-302446	2
Noweda	Estradiol hemihydrate	15038004	1
Caelo	Estradiol hemihydrate	15038004	5
Caelo	Estradiol hemihydrate	1503801	1
Caelo	Estradiol hemihydrate	15038010	3
Sanacorp	Estradiol hemihydrate	15038010	1
Caelo	Estradiol hemihydrate	15038014	2
Gehe	Estradiol hemihydrate	15038016	1
Euro OTC	Estradiol hemihydrate	1510039-01	1
Euro OTC	Estradiol hemihydrate	15D01-B02	1
Fagron	Estradiol hemihydrate	15D01-B02-308190	1
Fagron	Estradiol hemihydrate	15D01-B02-308568	1
Fagron	Estradiol hemihydrate	15D01-B02-319032	2
Caelo	Estradiol hemihydrate	15D01-B02-319032	1
Euro OTC	Estradiol hemihydrate	1601017-01	1
Caelo	Estradiol hemihydrate	160700301	1
Euro OTC	Estradiol hemihydrate	1607003-0101374814	1
Fagron	Estradiol hemihydrate	16D12-B01-326783	1
Fagron	Estradiol hemihydrate	16h04-b01-328738	1
Fagron	Estradiol hemihydrate	16h04-b01-337595	1
Caelo	Estradiol hemihydrate	19051501	1
Fagron	Estradiol hemihydrate	302446	1
Caelo	Estradiol hemihydrate	2/AKD13	1
Fagron	Estradiol hemihydrate	83100820	2
Fagron	Estradiol hemihydrate	84201170	1
Caelo	Estradiol hemihydrate	84201560	1
Caelo	Estradiol hemihydrate	9248916	3
Alliance Health 27.05.2...	Estradiol hemihydrate	9A09-N26	1
Fagron	Estradiol hemihydrate	9G07N01	1
Fagron	Estradiol hemihydrate	9J27-N05	1
Fagron	Estradiol hemihydrate	11031401	1

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Supplier	Substance	Batch	Spectra
Caelo	Estradiol hemihydrate	11078104	1
Caelo	Estradiol hemihydrate	11078113	1
Caelo	Estradiol hemihydrate	12172003	2
Fagron	Estradiol hemihydrate	11H23-N02	1
Caelo	Estradiol hemihydrate	12268003	2
Noweda	Estradiol hemihydrate	12268008	1
Fagron	Estradiol hemihydrate	12F29-N03	6
Fagron	Estradiol hemihydrate	12F29-N03	1
Fagron	Estradiol hemihydrate	12L19-N07	6
Fagron	Estradiol hemihydrate	12L29-N07	1
Caelo	Estradiol hemihydrate	13285801	1
Caelo	Estradiol hemihydrate	22101301	1
Gehe	Estradiol hemihydrate	82404160	1
Anzag; 12.72EUR; 7.10.2015	Estradiol hemihydrate	15038004	2
Caelo	Estradiol hemihydrate	12F29-N03	1
Euro OTC	Estradiol hemihydrate	1607003-01	1

- 77 041 spectra from 463 *Apo-Ident* customers from a total of 25 487 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Estradiol hemihydrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Estradiol hemihydrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	498	1	71 934
Type B	0	1365	0	160 708
Type C	0	115	3	77 041

The substance/substance group *Estradiol hemihydrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9887 %)	99.7996 % (> 99.1984 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 99.5604 %)
Type C	100.0000 % (> 99.8850 %)	97.4576 % (> 94.9153 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21291	21945	3.37	36.21
21302	21302	0.00	33.80
21508	21508	0.00	37.96
21667	21945	1.55	36.04
21847	21847	0.00	43.22
21945	21945	0.00	37.31
22307	22307	0.00	36.79
22913	22913	0.00	35.43
23184	21945	2.99	35.76

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Estradiol valerate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20330-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Estradiol valerate; Estradioli valeras; Oestradiolum valerianicum

Special notes

When selecting the *Estradiol valerate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Estradiol valerate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Estradiol valerate	12D18-N02	20651	40	20120426
Fagron	Estradiol valerate	12D18-N02	21266	40	20120118
Caelo	Estradiol valerate	13264001	21411	40	1410503
Caelo	Estradiol valerate	13264001	21416	60	1510624
Caelo	Estradiol valerate	13264001	21424	40	1410503

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Estradiol valerate	14E26-B02-294846	21646	40	20140616
Caelo	Estradiol valerate	15194802	21989	40	20150708
Caelo	Estradiol valerate	163277	23056	40	20161221*
Caelo	Estradiol valerate	13264001	21411SI	30	1410503
Caelo	Estradiol valerate	13264001	21416SI	30	1510624
Caelo	Estradiol valerate	15194802	21989SI	20	20150708
Caelo	Estradiol valerate	163277	23056SI	40	20161221*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 460 spectra of 12 reference samples from the substance/substance group *Estradiol valerate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 5 different batches.

- 71 973 spectra from a total of 1577 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 547 spectra from 25 reference samples of the substance/substance group *Estradiol valerate*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Estradiol valerate	11G18-N04	20330	40
Caelo	Estradiol valerate	13264001	21411†	20

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*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Estradiol valerate	13264001	21416†	60
Caelo	Estradiol valerate	13264001	21417	20
Caelo	Estradiol valerate	13264001	21418	20
Caelo	Estradiol valerate	13264001	21419	20
Caelo	Estradiol valerate	13264001	21422	20
Caelo	Estradiol valerate	13264001	21423	20
Caelo	Estradiol valerate	13264001	21424†	20
Caelo	Estradiol valerate	13264001	21425	20
Caelo	Estradiol valerate	13264001	21426	20
Fagron	Estradiol valerate	14E26-B02-294846	21646†	20
Caelo	Estradiol valerate	15194802	21989†	20
Caelo	Estradiol valerate	180674	24030	40
Caelo	Estradiol valerate	13264001	21411SI†	15
Caelo	Estradiol valerate	13264001	21416SI†	15
Caelo	Estradiol valerate	13264001	21417SI	14
Caelo	Estradiol valerate	13264001	21418SI	15
Caelo	Estradiol valerate	13264001	21419SI	15
Caelo	Estradiol valerate	13264001	21422SI	17
Caelo	Estradiol valerate	13264001	21423SI	15
Caelo	Estradiol valerate	13264001	21425SI	15
Caelo	Estradiol valerate	13264001	21426SI	16
Caelo	Estradiol valerate	15194802	21989SI†	10
Caelo	Estradiol valerate	180674	24030SI	40

- 161 526 spectra from a total of 3494 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 118 spectra from 57 *Apo-Ident* customers from 60 batches from the substance/substance group *Estradiol valerate*.

- These include spectra of independent samples from 58 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Estradiol valerate	13g09-n05	2
Fagron	Estradiol valerate	12A20-N10	3
Fagron	Estradiol valerate	814M-03259	1
Caelo	Estradiol valerate	13264001	1
Fagron	Estradiol valerate	13A07-N11	6
Fagron	Estradiol valerate	13D16-N10	4
Fagron	Estradiol valerate	13G09N05	1
Fagron	Estradiol valerate	13G09-N05	5

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†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Supplier	Substance	Batch	Spectra
Fagron	Estradiol valerate	13I13-N02	2
Fagron	Estradiol valerate	14E26B02	2
Caelo	Estradiol valerate	14E26-B02-294844	1
Fagron	Estradiol valerate	14E26-B02-294844	1
Fagron	Estradiol valerate	14E26-B02-294845	3
Caelo	Estradiol valerate	14E26-B02-294845	1
Fagron	Estradiol valerate	14E26-B02-294847	1
Fagron	Estradiol valerate	14E26-B02-296348	5
Fagron	Estradiol valerate	14E26-b02-302872	1
Fagron	Estradiol valerate	14E26-B02-302873	3
Caelo	Estradiol valerate	15194808	1
Fagron	Estradiol valerate	15C10-B05	1
Hedinger/Noweda	Estradiol valerate	15C10-B05	1
Euro OTC	Estradiol valerate	15C10-b05	1
Frago/Gehe	Estradiol valerate	15C10-B0508561040	1
Fagron	Estradiol valerate	15C10-B05-305395	3
Bayer Pharma AG	Estradiol valerate	15C10-B05-305395	1
Fagron	Estradiol valerate	15C10-B05-305396	1
Caelo	Estradiol valerate	15c10-B05-305396	1
Fagron	Estradiol valerate	15C10-B05-308851	6
Caelo	Estradiol valerate	15C10B05308851	1
Fagron	Estradiol valerate	15C10-B05-309186	3
Fagron	Estradiol valerate	15c10-b05-309186	1
Fagron	Estradiol valerate	15C10-B05-313568	1
Fagron	Estradiol valerate	15C10-B05-314840	3
Fagron	Estradiol valerate	15C10-B05-318405	1
Caelo	Estradiol valerate	15C10-B05-321675	1
Fagron	Estradiol valerate	15C10B05321675	1
Fagron	Estradiol valerate	15C10-B05-321675	2
Phönix	Estradiol valerate	15C10-B05-326087	1
Fagron	Estradiol valerate	15C10-B05-326087	1
Fagron	Estradiol valerate	15C10B05-326087	1
Caelo	Estradiol valerate	16327702	1
Frago/Noweda	Estradiol valerate	16F09-B01	2
Frago/Noweda	Estradiol valerate	16F09-B01-329621	1
Fagron	Estradiol valerate	16F09-B01-332756	1
Frago/Noweda	Estradiol valerate	16F09-B01-332757	1
Fagron	Estradiol valerate	19c10-b05-318405	1
Fagron	Estradiol valerate	24052014a	1
Caelo	Estradiol valerate	4214U-03259	1
Caelo	Estradiol valerate	5315A-03259	1
Fagron	Estradiol valerate	84404140	1
Fagron	Estradiol valerate	10L20-N05	1
Fagron	Estradiol valerate	11G18-N04	1
Fagron	Estradiol valerate	11J13-N09	1
Fagron	Estradiol valerate	11J13-No9	1
Fagron	Estradiol valerate	11K04-N04	1
Fagron	Estradiol valerate	11k04-n04	1
Noweda	Estradiol valerate	12A20-N10	1
Fagron	Estradiol valerate	12D18-N02	3
Caelo	Estradiol valerate	12G05-N09	2
Fagron	Estradiol valerate	12G05-N09	2
Fagron	Estradiol valerate	12G05N09	1
Fagron	Estradiol valerate	12K05-N02	2
Caelo	Estradiol valerate	13264002	1
Jenne	Estradiol valerate	13A07-N11	1
Sanacorp	Estradiol valerate	13264002	1
Caelo	Estradiol valerate	13264003	1
Fagron	Estradiol valerate	13a07-n11	1
Fagron	Estradiol valerate	13D16N10	1

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Supplier	Substance	Batch	Spectra
Fagron	Estradiol valerate	82201620	1
Phoenix	Estradiol valerate	13G09-N05	1
Caelo	Estradiol valerate	test	1
Bayer Pharma GmbH	Estradiol valerate	82201620	1
Beiersdorf/AHD	Estradiol valerate	12A20-N10	1
Beiersdorf/AHD	Estradiol valerate	12G05-N09	2

- 77 041 spectra from 463 *Apo-Ident* customers from a total of 25 488 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Estradiol valerate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Estradiol valerate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	460	0	71 973
Type B	0	547	0	161 526
Type C	0	116	2	77 041

The substance/substance group *Estradiol valerate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9887 %)	100.0000 % (> 98.6957 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 98.9031 %)
Type C	100.0000 % (> 99.8850 %)	98.3051 % (> 95.7627 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20651	21416	2.30	39.08
21266	23056	4.80	52.22
21411	21411	0.00	37.40
21416	21416	0.00	38.40
21424	21424	0.00	45.36
21646	21424	5.93	50.53
21989	21424	2.68	44.03
23056	23056	0.00	54.65

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Estriol**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20878-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Estriol; Estriolum; Oestriolum

Special notes

When selecting the *Estriol* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Estriol*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Estriol	12298706	20878	40	20121106
Fagron	Estriol	11J13-N07	21255	40	1412180
Caelo	Estriol	13256001	21390	50	1511155
Euro OTC	Estriol	1507026	21848	40	0000010671
Euro OTC	Estriol	1509042	21939	40	20151009*

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Estriol	16D15-B03-322957	22889	40	20160711
Fagron	Estriol	16I19-B01-331468	23172	40	20170301
Euro OTC	Estriol	1703044	23181	40	20170502*
Caelo	Estriol	13256001	21390SI	40	1511155
Euro OTC	Estriol	1507026	21848SI	40	0000010671
Euro OTC	Estriol	1509042	21939SI	40	20151009*
Fagron	Estriol	16D15-B03-322957	22889SI	40	20160711

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 490 spectra of 12 reference samples from the substance/substance group *Estriol*. These samples are listed above in the section *calibration samples*. The reference samples originate from 8 different batches.

- 71 943 spectra from a total of 1574 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 1150 spectra from 38 reference samples of the substance/substance group *Estriol*.

- These include spectra of independent samples from 7 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Estriol	1310002-01	21292	40
Caelo	Estriol	13256001	21390†	20

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*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Estriol	13256001	21391	60
Caelo	Estriol	13256001	21392	20
Caelo	Estriol	13256001	21393	60
Caelo	Estriol	13256001	21394	20
Caelo	Estriol	13256001	21395	15
Caelo	Estriol	13256001	21399	15
Caelo	Estriol	13256001	21400	20
Caelo	Estriol	13256001	21401	20
Caelo	Estriol	13256001	21404	20
Euro OTC	Estriol	1507026	21848†	20
Euro OTC	Estriol	1509042	21939†	20
Caelo	Estriol	161382	22633	40
Euro OTC	Estriol	1606044	22711	40
Euro OTC	Estriol	1610035	22850	40
Euro OTC	Estriol	1710022	23731	40
Euro OTC	Estriol	1710030	23733	40
Euro OTC	Estriol	1803011	24073	40
Caelo	Estriol	13256001	21390SI†	20
Caelo	Estriol	13256001	21391SI	60
Caelo	Estriol	13256001	21392SI	20
Caelo	Estriol	13256001	21394SI	20
Caelo	Estriol	13256001	21395SI	15
Caelo	Estriol	13256001	21399SI	15
Caelo	Estriol	13256001	21400SI	20
Caelo	Estriol	13256001	21401SI	20
Caelo	Estriol	13256001	21404SI	20
Euro OTC	Estriol	1507026	21848SI†	20
Euro OTC	Estriol	1509042	21939SI†	20
Caelo	Estriol	161382	22633SI	40
Euro OTC	Estriol	1606044	22711SI	40
Euro OTC	Estriol	1610035	22850SI	40
Fagron	Estriol	16I19-B01-331468	23172SI	30
Euro OTC	Estriol	1703044	23181SI	40
Euro OTC	Estriol	1710022	23731SI	40
Euro OTC	Estriol	1710030	23733SI	40
Euro OTC	Estriol	1803011	24073SI	40

- 160 923 spectra from a total of 3487 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 197 spectra from 90 *Apo-Ident* customers from 89 batches from the substance/substance group *Estriol*.

- These include spectra of independent samples from 85 batches, of which no spectra have been used for the generation of the database.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Supplier	Substance	Batch	Spectra
Caelo	Estriol	10053206	1
Caelo	Estriol	10H30-N06	1
Caelo	Estriol	11254402	2
Caelo	Estriol	11254408	1
Caelo	Estriol	11254410	1
Noweda	Estriol	11254409	1
Caelo	Estriol	11254412	2
Fagron	Estriol	11D13-N11	1
Fagron	Estriol	11J13-N07	3
Noweda	Estriol	11J13-No7	1
Euro OTC	Estriol	1201020-01	1
Caelo	Estriol	12032503	4
Noweda	Estriol	12032504	1
Caelo	Estriol	12032504	2
Caelo	Estriol	12032507	5
Caelo	Estriol	12298702	2
Caelo	Estriol	12298704	7
Caelo	Estriol	12298706	3
Caelo	Estriol	12298707	3
Caesar § Lorenz GmbH	Estriol	12298712	1
Fagron	Estriol	12A26-N02	2
Fagron	Estriol	12F08-N06	1
Caelo	Estriol	12H06N02	1
Fagron	Estriol	12H06-N02	5
Caelo	Estriol	12H06-N02	2
Fagron	Estriol	12H06-No2	2
Fagron	Estriol	12K07-N15	2
Caelo	Estriol	13256004	10
Euro OTC	Estriol	1310002-01	1
Sanacorp	Estriol	13256004	1
VDL	Estriol	13256004	1
Caelo	Estriol	1356001	1
Fagron	Estriol	13C15-N04	4
Fagron	Estriol	13D19-N02	1
Sanacorp	Estriol	13D19-N05	1
Fagron	Estriol	13H28-N01	4
Euro OTC	Estriol	1403011-01	3
Caelo	Estriol	14077901	1
Caelo	Estriol	14077903	3
Caelo	Estriol	14077904	10
Kehr/Apomix	Estriol	14077904	1
Euro OTC	Estriol	1409018-01	2
Caelo	Estriol	1409018-01	1
Caelo	Estriol	14272101	3
Caelo	Estriol	14272104	3
Noweda 19.05.2015	Estriol	14272104	1
Caelo	Estriol	1477904	1
Fagron	Estriol	14B06-B11-291563	1
Gehe 30.12.14	Estriol	14B06-B11-291563	1
Fagron	Estriol	14B06-B11-291565	1
Fagron	Estriol	14B06-B11-294565	1
Fagron	Estriol	14b06b11291565	1
Fagron	Estriol	14E13-B01	2
Fagron	Estriol	14E13-B01-294033	1
Fagron	Estriol	14E13-B01-294034	4
Fischar/Gehe	Estriol	14H29-B02-298072	3
Fagron	Estriol	14E29-B02	1
Fagron	Estriol	14H29-B02-298074	2
Caelo	Estriol	14j20-b07	1
Caelo	Estriol	15008902	1

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Supplier	Substance	Batch	Spectra
Caelo	Estriol	15028901	4
Caesar & Loretz GmbH	Estriol	15028901	1
Euro OTC	Estriol	15028904	1
Caesar & Loretz GmbH	Estriol	15028904	1
Caelo	Estriol	15028904	5
Caelo	Estriol	15028905	2
Caelo	Estriol	15297804	9
Caesar&Loretz,AHC, 19.0...	Estriol	15297804	1
Fagron	Estriol	15297804	2
Fagron	Estriol	15A15-B07-312064	1
Caelo	Estriol	15297805	1
Caelo	Estriol	16/19-B01-331467	1
Caelo	Estriol	16053405	2
Ensbona/ Sanacorp	Estriol	16053405	1
Gehe	Estriol	16053405	1
Caelo	Estriol	16053408	1
Euro OTC	Estriol	1606044-01	1
Euro OTC	Estriol	1610035-01	1
Sanacorp	Estriol	16317701	1
Sanacorp	Estriol	16317702	1
Caelo	Estriol	16317703	2
Fagron	Estriol	16D15-B03-323017	1
Fagron	Estriol	16I19-B01	1
Fagron	Estriol	16I19-B01-331468	1
Caelo	Estriol	17042014B	1
Caelo	Estriol	17133706	2
Caelo	Estriol	1733706	1
Caelo	Estriol	20040711-9	1
Haihang Industry	Estriol	20130824	1
Caelo	Estriol	24031501	1
Caelo	Estriol	27061303	1
Bombastus	Estriol	5128	1
Fagron	Estriol	81100490	1
Audor Pharma	Estriol	APL000036940E	1
Audor Pharma	Estriol	APL00036940E	2
Audor Pharma	Estriol	APL00037293E	1
Audor Pharma	Estriol		1
Audor Pharma	Estriol	APL00037293	1
NWM CHina	Estriol	ES150304	1
Shandong Northwest Manu...	Estriol	ETL160302	1
fargon	Estriol	12a26-n02	1
Shandong Northwest Manu...	Estriol	ETL160419	1
Caelo	Estriol	16138204	1
Caelo	Estriol	16317702	1
Caelo	Estriol	13256001	1

- 76 962 spectra from 463 *Apo-Ident* customers from a total of 25 459 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Estriol* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all

relevant spectra of the various substances were compared with *Estriol* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	490	0	71 943
Type B	0	1145	5	160 923
Type C	0	189	8	76 962

The substance/substance group *Estriol* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9887 %)	100.0000 % (> 98.7755 %)
Type B	100.0000 % (> 99.9928 %)	99.5652 % (> 99.3043 %)
Type C	100.0000 % (> 99.8850 %)	95.9391 % (> 94.4162 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20878	21939	3.04	43.36
21255	21255	0.00	43.95
21390	21390	0.00	31.37
21848	21848	0.00	32.15
21939	21939	0.00	38.88
22889	23181	8.03	51.56
23172	21939	3.77	43.63
23181	23181	0.00	50.10

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Ethacridine lactate monohydrate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20750-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Ethacridine lactate monohydrate; Aethacridinum lacticum monohydricum; Ethacridini lactas monohydricus

Special notes

When selecting the *Ethacridine lactate monohydrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Ethacridine lactate monohydrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Ethacridine lact…	12149507	20750	40	20120619
Fagron	Ethacridine lact…	13I24-N03	21265	40	AR-15-FG-007011-02
Euro OTC	Ethacridine lact…	1206016-02	21636	40	20121019
Fagron	Ethacridine lact…	15A29-B02-306219	22500	40	20150205

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 4 reference samples from the substance/substance group *Ethacridine lactate monohydrate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 4 different batches.

- 72 273 spectra from a total of 1578 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 180 spectra from 5 reference samples of the substance/substance group *Ethacridine lactate monohydrate*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Ethacridine lactate monohydr…	1206016-02	21636†	20
Euro OTC	Ethacridine lactate monohydr…	1412034-02	22733	40
Caelo	Ethacridine lactate monohydr…	16273403	23247	40
Caelo	Ethacridine lactate monohydr…	172476	23671	40
Caelo	Ethacridine lactate monohydr…	172476	23798	40

- 161 893 spectra from a total of 3495 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B*

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 147 spectra from 91 *Apo-Ident* customers from 53 batches from the substance/substance group *Ethacridine lactate monohydrate*.

- These include spectra of independent samples from 50 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Chinosol/Anzag	Ethacridine lactate monohydr…	914E-02196	1
Fagron	Ethacridine lactate monohydr…	14A15-B04-300493	8
Fagron	Ethacridine lactate monohydr…	12/24-N04	2
Euro OTC	Ethacridine lactate monohydr…	1206016-02	5
Euro OTC	Ethacridine lactate monohydr…	1206016-03	6
Caelo	Ethacridine lactate monohydr…	12268407	3
Fagron	Ethacridine lactate monohydr…	12324N03	1
Fagron	Ethacridine lactate monohydr…	12G02-N13	7
Bombastus	Ethacridine lactate monohydr…	13/24-N03	1
Euro OTC	Ethacridine lactate monohydr…	13/24-N03	1
phoenix 18.11.2014	Ethacridine lactate monohydr…	13/24-N03	1
Fagron	Ethacridine lactate monohydr…	13/24-N03	2
Fagron	Ethacridine lactate monohydr…	13/24-NO3	1
Fagron	Ethacridine lactate monohydr…	13I24-N03	7
Fagron	Ethacridine lactate monohydr…	13l24-N03	1
Dermapharm	Ethacridine lactate monohydr…	141101	3
Caelo	Ethacridine lactate monohydr…	141203401	1
Euro OTC	Ethacridine lactate monohydr…	1412034-01	4
Caelo	Ethacridine lactate monohydr…	1412034-01	1
Euro OTC	Ethacridine lactate monohydr…	1412034-03	1
Fagron	Ethacridine lactate monohydr…	14A15-B04	1
Bombastus	Ethacridine lactate monohydr…	14A15-B04-300493	1
Caelo	Ethacridine lactate monohydr…	15177603	3
Caelo	Ethacridine lactate monohydr…	15438001	1
Caelo	Ethacridine lactate monohydr…	15177608	1
Caelo	Ethacridine lactate monohydr…	15438003	4
Caelo	Ethacridine lactate monohydr…	15438007	4
Euro OTC	Ethacridine lactate monohydr…	15438007	1
Caesar & Loretz GmbH Hi…	Ethacridine lactate monohydr…	15438007	1
Caelo	Ethacridine lactate monohydr…	16272401	1
Caelo	Ethacridine lactate monohydr…	16272408	1
Caelo	Ethacridine lactate monohydr…	16272406	1
Caelo	Ethacridine lactate monohydr…	16273403	5
Caelo	Ethacridine lactate monohydr…	16273411	1
Fagron	Ethacridine lactate monohydr…	16e20-b11-322514	1
Fagron	Ethacridine lactate monohydr…	16E20-B11-322514	4
Fagron	Ethacridine lactate monohydr…	201311004	1
Dermapharm	Ethacridine lactate monohydr…	100201	2
Euro OTC	Ethacridine lactate monohydr…	2905007v-03	1
Fagron	Ethacridine lactate monohydr…	11/07-N05	1
Caelo	Ethacridine lactate monohydr…	10288702	1
Fagron	Ethacridine lactate monohydr…	103485-0006	1
Caelo	Ethacridine lactate monohydr…	11173703	1
Fagron	Ethacridine lactate monohydr…	11D07-N03	1

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Supplier	Substance	Batch	Spectra
Fargon	Ethacridine lactate monohydr…	11D07-N03	1
Caelo	Ethacridine lactate monohydr…	11J07-N05	1
Caelo	Ethacridine lactate monohydr…	1206016-03	1
Caelo	Ethacridine lactate monohydr…	12149507	3
Fagron	Ethacridine lactate monohydr…	12A02-N10	1
Fagron	Ethacridine lactate monohydr…	12C30-N07	2
Gehe	Ethacridine lactate monohydr…	12G02-N13	1
Caelo	Ethacridine lactate monohydr…	12G02-N13	2
Fagron	Ethacridine lactate monohydr…	12J24-N04	1
Fagron	Ethacridine lactate monohydr…	12G02-N135-15	1
Phonix	Ethacridine lactate monohydr…	13I24-N03	1
Gehe	Ethacridine lactate monohydr…	13I24-N03	1
Fagron	Ethacridine lactate monohydr…	201205001	4
Chinosol/Anzag	Ethacridine lactate monohydr…	2112A-02196	1
Fagron	Ethacridine lactate monohydr…	2405210013	1
Euro OTC	Ethacridine lactate monohydr…	2905007-01	2
Euro OTC	Ethacridine lactate monohydr…	2905007V-03	2
Dermapharm	Ethacridine lactate monohydr…	130201	7
Dermopharm	Ethacridine lactate monohydr…	141101	1
Ebert & Jacobi 19.07…	Ethacridine lactate monohydr…	141101	2
Caelo	Ethacridine lactate monohydr…	15/214/R	1
Finze	Ethacridine lactate monohydr…	90601	1
Phoenix	Ethacridine lactate monohydr…	100201	1
Dermapharm	Ethacridine lactate monohydr…	111201	7
Anzag	Ethacridine lactate monohydr…	111201	1
Phönix	Ethacridine lactate monohydr…	111201	1
Caelo	Ethacridine lactate monohydr…	12149514	1
Dermopharm	Ethacridine lactate monohydr…	130201	1

- 77 012 spectra from 463 *Apo-Ident* customers from a total of 25 494 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Ethacridine lactate monohydrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ethacridine lactate monohydrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	160	0	72 273
Type B	0	150	30	161 893
Type C	0	118	29	77 012

The substance/substance group *Ethacridine lactate monohydrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9928 %)	83.3333 % (> 81.6667 %)
Type C	100.0000 % (> 99.8850 %)	80.2721 % (> 78.2313 %)

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In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20750	21265	13.01	31.30
21265	21265	0.00	30.99
21636	21265	8.04	31.04
22500	21265	13.03	29.79

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Ethinylestradiol**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20950-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Ethinylestradiol; Aethinyloestradiolum; Ethinylestradiolum

Special notes

When selecting the *Ethinylestradiol* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Ethinylestradiol*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Ethinylestradiol	13I09-N04	20950	40	1402058
Fagron	Ethinylestradiol	14E15-B03-296049	21705	40	1507109
Fagron	Ethinylestradiol	14E15-B03-310270	21916	40	20140708
Fagron	Ethinylestradiol	14E15-B03-296049	21705SI	36	1507109
Fagron	Ethinylestradiol	14E15-B03-310270	21916SI	40	20140708

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 196 spectra of 5 reference samples from the substance/substance group *Ethinylestradiol*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 237 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 248 spectra from 8 reference samples of the substance/substance group *Ethinylestradiol*.

- These include spectra of independent samples from 1 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Ethinylestradiol	14E15-B03-296049	21705†	15
Fagron	Ethinylestradiol	14E15-B03-310270	21916†	20
Fagron	Ethinylestradiol	14E15-B03-310270	21958	60
Fagron	Ethinylestradiol	16B17-B01-329904	23075	40
Fagron	Ethinylestradiol	14E15-B03-296049	21705SI†	20
Fagron	Ethinylestradiol	14E15-B03-310270	21916SI†	20
Fagron	Ethinylestradiol	14E15-B03-310270	21958SI	43
Fagron	Ethinylestradiol	16B17-B01-329904	23075SI	30

- 161 825 spectra from a total of 3496 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 8 spectra from 7 *Apo-Ident* customers from 7 batches from the substance/substance group *Ethinylestradiol*.

- These include spectra of independent samples from 6 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Ethinylestradiol	13G03-N04	1
Caelo	Ethinylestradiol	130909	1
Fagron	Ethinylestradiol	13I09-N04	1
Fagron	Ethinylestradiol	14e15b03296049	1
Fagron	Ethinylestradiol	16B17-B01	1
Fagron	Ethinylestradiol	12D19-N04	2
Fagron	Ethinylestradiol	84100720	1

- 77 151 spectra from 463 *Apo-Ident* customers from a total of 25 540 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Ethinylestradiol* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ethinylestradiol* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	196	0	72 237
Type B	0	248	0	161 825
Type C	0	6	2	77 151

The substance/substance group *Ethinylestradiol* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.9388 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 97.5806 %)
Type C	100.0000 % (> 99.8851 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several

new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20950	20950	0.00	17.97
21705	21705	0.00	22.02
21916	21705	9.65	24.61

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Ethyl hydrogen fumarate calcium**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	21532-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Ethyl hydrogen fumarate calcium; Calcii ethylhydrogenfumaras; Calcii ethylhydrogenofumaras

Special notes

When selecting the *Ethyl hydrogen fumarate calcium* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Ethyl hydrogen fumarate calcium*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Ethyl hydrogen f…	13B25-N08	21532	40	1411090
Euro OTC	Ethyl hydrogen f…	1310029-01	21562	40	20131126
Euro OTC	Ethyl hydrogen f…	1306012-01	21641	40	1505456
Euro OTC	Ethyl hydrogen f…	1510005	21938	40	20151030*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 4 reference samples from the substance/substance group *Ethyl hydrogen fumarate calcium*. These samples are listed above in the section *calibration samples*. The reference samples originate from 4 different batches.

- 72 273 spectra from a total of 1578 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 152 spectra from 6 reference samples of the substance/substance group *Ethyl hydrogen fumarate calcium*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Ethyl hydrogen fumarate calc…	13B25-N08	21532†	20
Euro OTC	Ethyl hydrogen fumarate calc…	1310029-01	21562†	20
Euro OTC	Ethyl hydrogen fumarate calc…	1306012-01	21641†	20
Euro OTC	Ethyl hydrogen fumarate calc…	1510005	21938†	20
Euro OTC	Ethyl hydrogen fumarate calc…	1601011	22294	60
Euro OTC	Ethyl hydrogen fumarate calc…	1510005-01	not required	12

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 921 spectra from a total of 3493 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 0 spectra from 0 *Apo-Ident* customers from 0 batches from the substance/substance group *Ethyl hydrogen fumarate calcium*.

- These include spectra of independent samples from 0 batches, of which no spectra have been used for the generation of the database.

- 77 159 spectra from 463 *Apo-Ident* customers from a total of 25 547 batches from a further 701 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Ethyl hydrogen fumarate calcium* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ethyl hydrogen fumarate calcium* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	160	0	72 273
Type B	0	151	1	161 921
Type C	0	0	0	77 159

The substance/substance group *Ethyl hydrogen fumarate calcium* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9928 %)	99.3421 % (> 97.3684 %)
Type C	100.0000 % (> 99.8849 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21532	21532	0.00	39.20
21562	21641	13.84	44.21
21641	21641	0.00	42.74
21938	21938	0.00	47.33

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Ethyl hydrogen fumarate magnesium**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	21533-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Ethyl hydrogen fumarate magnesium; Magnesii ethylhydrogenofumaras

Special notes

When selecting the *Ethyl hydrogen fumarate magnesium* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Ethyl hydrogen fumarate magnesium*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Ethyl hydrogen f…	13G10-N01	21533	40	1411091
Euro OTC	Ethyl hydrogen f…	1510006	21937	40	20151030*
Euro OTC	Ethyl hydrogen f…	1601010	22290	40	20160114*
Euro OTC	Ethyl hydrogen f…	1510006-01	23008	40	AR-18-FG-000547-01

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 4 reference samples from the substance/substance group *Ethyl hydrogen fumarate magnesium*. These samples are listed above in the section *calibration samples*. The reference samples originate from 4 different batches.

- 72 273 spectra from a total of 1578 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 126 spectra from 5 reference samples of the substance/substance group *Ethyl hydrogen fumarate magnesium*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Ethyl hydrogen fumarate magn…	13G10-N01	21533†	20
Euro OTC	Ethyl hydrogen fumarate magn…	1306014-01	21642	60
Euro OTC	Ethyl hydrogen fumarate magn…	1510006	21937†	20
Euro OTC	Ethyl hydrogen fumarate magn…	1601010	22290†	20
Fagron	Ethyl hydrogen fumarate magn…	14H27-B04-299502	not required	6

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 947 spectra from a total of 3495 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 0 spectra from 0 *Apo-Ident* customers from 0 batches from the substance/substance group *Ethyl hydrogen fumarate magnesium*.

- These include spectra of independent samples from 0 batches, of which no spectra have been used for the generation of the database.

- 77 159 spectra from 463 *Apo-Ident* customers from a total of 25 547 batches from a further 701 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Ethyl hydrogen fumarate magnesium* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ethyl hydrogen fumarate magnesium* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	72 273
Type B	0	100	26	161 947
Type C	0	0	0	77 159

The substance/substance group *Ethyl hydrogen fumarate magnesium* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9928 %)	79.3651 % (> 76.9841 %)
Type C	100.0000 % (> 99.8849 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21533	21533	0.00	41.47
21937	21937	0.00	34.97
22290	22290	0.00	38.02
23008	23008	0.00	41.76

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Fampridine**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20902-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Fampridine; Fampridinum

Special notes

When selecting the *Fampridine* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Fampridine*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Fampridine	13G26-N06	20902	40	1402686
Fagron	Fampridine	14D11-B06-293750	21541	40	20140113
Fagron	Fampridine	16D11-B07-318220	22491	40	AR-16-FG-011566-01
Fagron	Fampridine	16E25-B03-324097	22894	40	20160609
Caelo	Fampridine	16276001	22905	40	20161024
Caelo	Fampridine	16276001	23237	40	20161024

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 240 spectra of 6 reference samples from the substance/substance group *Fampridine*. These samples are listed above in the section *calibration samples*. The reference samples originate from 5 different batches.

- 72 193 spectra from a total of 1577 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 180 spectra from 5 reference samples of the substance/substance group *Fampridine*.

- These include spectra of independent samples from 1 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Fampridine	14D11-B06-293750	21541†	20
Caelo	Fampridine	16276001	22881	40
Fagron	Fampridine	16E25-B03-324097	22945	40
Caelo	Fampridine	16276001	23074	40
Caelo	Fampridine	172170	23653	40

- 161 893 spectra from a total of 3495 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 7 spectra from 5 *Apo-Ident* customers from 7 batches from the substance/substance group *Fampridine*.

- These include spectra of independent samples from 7 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Fampridine	14D11-B06-296110	1
Inresa	Fampridine	220825	1
Fagron	Fampridine	14D11-B40-301641	1
Caelo	Fampridine	15350001	1
Caelo	Fampridine	15350002	1
Fagron	Fampridine	16D11-B07	1
Fagron	Fampridine	13C07-B02-289395	1

- 77 152 spectra from 463 *Apo-Ident* customers from a total of 25 540 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Fampridine* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Fampridine* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	240	0	72 193
Type B	0	157	23	161 893
Type C	0	7	0	77 152

The substance/substance group *Fampridine* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.5000 %)
Type B	100.0000 % (> 99.9928 %)	87.2222 % (> 85.5556 %)
Type C	100.0000 % (> 99.8851 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to

exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20902	20902	0.00	72.88
21541	20902	5.63	70.24
22491	22491	0.00	76.34
22894	22491	8.75	76.43
22905	22491	14.91	73.75
23237	22491	17.44	75.20

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Finasteride (form III)**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20955-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Finasteride (form III); Finasteridum (Form III)

Special notes

When selecting the *Finasteride (form III)* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Finasteride (form III)*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Finasteride (for…	13I03-N01	20955	40	1411272
Euro OTC	Finasteride (for…	1403016-01	21626	40	1506004
Fagron	Finasteride (for…	14A16-B40-295980	21742	40	20140317
Euro OTC	Finasteride (for…	1403016-02	21750	40	20140505
Euro OTC	Finasteride (for…	1605020	22565	40	20160613*

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Finasteride (for…	1610012	22856	40	20161116*
Fagron	Finasteride (for…	14A16-B40-295980	21742SI	30	20140317
Euro OTC	Finasteride (for…	1403016-02	21750SI	36	20140505
Euro OTC	Finasteride (for…	1605020	22565SI	40	20160613*
Euro OTC	Finasteride (for…	1610012	22856SI	33	20161116*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 379 spectra of 10 reference samples from the substance/substance group *Finasteride (form III)*. These samples are listed above in the section *calibration samples*. The reference samples originate from 6 different batches.

- 72 054 spectra from a total of 1576 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 330 spectra from 11 reference samples of the substance/substance group *Finasteride (form III)*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Finasteride (form III)	12A04-N09	20589	40
Euro OTC	Finasteride (form III)	1403016-01	21626†	20
Fagron	Finasteride (form III)	14A16-B40-295980	21742†	20
Euro OTC	Finasteride (form III)	1403016-02	21750†	20

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*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Finasteride (form III)	15J15-B02-320084	22594	40
Fagron	Finasteride (form III)	15J15-B02-320084	22595	40
Euro OTC	Finasteride (form III)	1704004	23151	40
Fagron	Finasteride (form III)	14A16-B40-295980	21742SI†	15
Euro OTC	Finasteride (form III)	1403016-02	21750SI†	15
Fagron	Finasteride (form III)	15J15-B02-320084	22594SI	40
Fagron	Finasteride (form III)	15J15-B02-320084	22595SI	40

- 161 743 spectra from a total of 3493 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 8 spectra from 3 *Apo-Ident* customers from 7 batches from the substance/substance group *Finasteride (form III)*.

- These include spectra of independent samples from 5 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Finasteride (form III)	14111305	1
Fagron	Finasteride (form III)	17011303	1
FRagron	Finasteride (form III)	13I03-N01	2
Euro OTC	Finasteride (form III)	1403016-02	1
Fagron	Finasteride (form III)	14L23-B02-306981	1
Euro OTC	Finasteride (form III)	1411008-01	1
Shandong Northwest Manu…	Finasteride (form III)	FNA160604	1

- 77 151 spectra from 463 *Apo-Ident* customers from a total of 25 540 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Finasteride (form III)* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Finasteride (form III)* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	379	0	72 054
Type B	0	330	0	161 743
Type C	0	8	0	77 151

The substance/substance group *Finasteride (form III)* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9887 %)	100.0000 % (> 98.4169 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 98.1818 %)
Type C	100.0000 % (> 99.8851 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20955	20955	0.00	40.51
21626	21626	0.00	51.40
21742	21626	14.72	48.19
21750	21626	14.31	47.75
22565	22565	0.00	49.90
22856	22856	0.00	52.14

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Fluocinolonacetonid, micronized**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	21031-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Fluocinolonacetonid, micronized; Fluocinoloni acetonidum micron.; Fluocinolonum acetonatum micron.

Special notes

When selecting the *Fluocinolonacetonid, micronized* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Fluocinolonacetonid, micronized*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Fluocinolonaceto…	2804013E-01	21031	40	1404008
Euro OTC	Fluocinolonaceto…	2804013E-01	21077	40	20121206
Caelo	Fluocinolonaceto…	12035003	21756	40	20120321
Euro OTC	Fluocinolonaceto…	2804013E-01	21822	40	20121206

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Fluocinolonaceto…	14L19-B04-307101	22267	30	20150219
Caelo	Fluocinolonaceto…	162281	22637	40	20160907*
Caelo	Fluocinolonaceto…	12035003	21756SI	33	20120321
Euro OTC	Fluocinolonaceto…	2804013E-01	21822SI	40	20121206
Fagron	Fluocinolonaceto…	14L19-B04-307101	22267SI	30	20150219
Caelo	Fluocinolonaceto…	162281	22637SI	30	20160907*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 363 spectra of 10 reference samples from the substance/substance group *Fluocinolonacetonid, micronized*. These samples are listed above in the section *calibration samples*. The reference samples originate from 4 different batches.

- 72 070 spectra from a total of 1578 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 353 spectra from 13 reference samples of the substance/substance group *Fluocinolonacetonid, micronized*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Fluocinolonacetonid, micronі…	2804013V-03	20243	40
Caelo	Fluocinolonacetonid, micronі…	12035003	21756†	20

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*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Fluocinolonacetonid, micronі…	2804013E-01	21822†	20
Euro OTC	Fluocinolonacetonid, micronі…	2804013E-01	21823	60
Fagron	Fluocinolonacetonid, micronі…	14L19-B04-307101	22267†	15
Fagron	Fluocinolonacetonid, micronі…	14L19-B04-307101	23080	40
Caelo	Fluocinolonacetonid, micronі…	172130	23674	30
Caelo	Fluocinolonacetonid, micronі…	12035003	21756SI†	15
Euro OTC	Fluocinolonacetonid, micronі…	2804013E-01	21822SI†	20
Euro OTC	Fluocinolonacetonid, micronі…	2804013E-01	21823SI	46
Fagron	Fluocinolonacetonid, micronі…	14L19-B04-307101	22267SI†	15
Fagron	Fluocinolonacetonid, micronі…	14L19-B04-307101	23080SI	20
Caelo	Fluocinolonacetonid, micronі…	172130	23674SI	12

- 161 720 spectra from a total of 3494 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 18 spectra from 7 *Apo-Ident* customers from 13 batches from the substance/substance group *Fluocinolonacetonid, micronized*.

- These include spectra of independent samples from 11 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fargon/Noweda	Fluocinolonacetonid, micronі…	13L13-B35	1
Fagron	Fluocinolonacetonid, micronі…	13L30-B35-295489	1
Euro OTC	Fluocinolonacetonid, micronі…	1408022-01	2
Euro OTC	Fluocinolonacetonid, micronі…	1408022-02	1
Fagron	Fluocinolonacetonid, micronі…	14L19-B04	3
Fargon/Kehr	Fluocinolonacetonid, micronі…	14L-19-B04	1
Fagron	Fluocinolonacetonid, micronі…	14L19-B04-317248	2
Fagron	Fluocinolonacetonid, micronі…	14L19-B04-615699	1
Euro OTC	Fluocinolonacetonid, micronі…	2804013E-01	1
Euro OTC	Fluocinolonacetonid, micronі…	2840013E-02	1
Fagron	Fluocinolonacetonid, micronі…	13E22-N10	1
Caelo	Fluocinolonacetonid, micronі…	2804013V-03	1
Caelo	Fluocinolonacetonid, micronі…	12035003	2

- 77 141 spectra from 463 *Apo-Ident* customers from a total of 25 534 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model,

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Fluocinolonacetonid, micronized* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Fluocinolonacetonid, micronized* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	363	0	72 070
Type B	0	323	30	161 720
Type C	0	13	5	77 141

The substance/substance group *Fluocinolonacetonid, micronized* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9887 %)	100.0000 % (> 98.3471 %)
Type B	100.0000 % (> 99.9928 %)	91.5014 % (> 90.6516 %)
Type C	100.0000 % (> 99.8850 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21031	21031	0.00	35.76
21077	21031	2.02	35.90
21756	21031	16.86	39.71
21822	21031	14.99	39.37
22267	21031	13.24	43.79
22637	22637	0.00	50.96

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Folic acid**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20370-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Folic acid; Acidum folicum

Special notes

When selecting the *Folic acid* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Folic acid*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Folic acid	12G17-N05	20767	40	20120727
Euro OTC	Folic acid	1401005-01	21288	40	20140131
Euro OTC	Folic acid	1508024	21891	40	20150902*
Euro OTC	Folic acid	1604036	22554	40	20160429*
Euro OTC	Folic acid	1611009	22868	40	20161201*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 200 spectra of 5 reference samples from the substance/substance group *Folic acid*. These samples are listed above in the section *calibration samples*. The reference samples originate from 5 different batches.

- 72 233 spectra from a total of 1577 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 140 spectra from 4 reference samples of the substance/substance group *Folic acid*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Folic acid	10F03-N13	20370	40
Euro OTC	Folic acid	1508024	21891†	20
Euro OTC	Folic acid	1608030	22818	40
Fagron	Folic acid	16C03-B06-322513	23081	40

- 161 933 spectra from a total of 3495 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 13 spectra from 11 *Apo-Ident* customers from 9 batches from the substance/substance group *Folic acid*.

- These include spectra of independent samples from 8 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Folic acid	13g16-n02	1
Fagron	Folic acid	10F03-N13	1
Euro OTC	Folic acid	1307041-01	1
Fagron	Folic acid	13A11-N01	1
Fagron	Folic acid	13G16-N02	4
Euro OTC	Folic acid	1401005-01	2
Euro OTC	Folic acid	1611009-01	1
Fagron	Folic acid	16C03-B06	1
Fagron	Folic acid	UT11110182	1

- 77 146 spectra from 463 *Apo-Ident* customers from a total of 25 538 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Folic acid* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Folic acid* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	200	0	72 233
Type B	0	124	16	161 933
Type C	0	13	0	77 146

The substance/substance group *Folic acid* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9928 %)	88.5714 % (> 86.4286 %)
Type C	100.0000 % (> 99.8850 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20767	21891	2.94	68.05
21288	21891	8.54	64.20
21891	21891	0.00	65.53
22554	22554	0.00	56.57
22868	22868	0.00	66.76

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Fructose**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20074-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Fructose; Fructosum; Laevulosum

Special notes

When selecting the *Fructose* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Fructose*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Fructose	1212015-01	21281	40	20130111
Euro OTC	Fructose	1509037	21934	40	20151027*
Euro OTC	Fructose	1512009	22292	40	20160113*
Caelo	Fructose	160667	22481	40	20160425*
Caelo	Fructose	15084311	22490	40	20150316
Euro OTC	Fructose	1701049	22986	40	20170213*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 240 spectra of 6 reference samples from the substance/substance group *Fructose*. These samples are listed above in the section *calibration samples*. The reference samples originate from 6 different batches.

- 72 193 spectra from a total of 1576 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 506 spectra from 14 reference samples of the substance/substance group *Fructose*.

- These include spectra of independent samples from 9 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Fructose	09302705	20074	45
Euro OTC	Fructose	1509037	21934†	20
Euro OTC	Fructose	1512009	22292†	20
Caelo	Fructose	160667	22481†	20
Euro OTC	Fructose	1604024	22547	41
Caelo	Fructose	15271213	22583	40
Euro OTC	Fructose	1607030	22693	40
Fagron	Fructose	16H05-B01-326259	23018	40
Fagron	Fructose	16H05-B01-326259	23082	40
Euro OTC	Fructose	1705002	23391	40
Caelo	Fructose	171439	23422	40
Caelo	Fructose	171439	23673	40
Euro OTC	Fructose	1710034	23901	40
Euro OTC	Fructose	1803040	24087	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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- 161 567 spectra from a total of 3487 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 423 spectra from 103 *Apo-Ident* customers from 161 batches from the substance/substance group *Fructose*.

- These include spectra of independent samples from 159 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Fructose	12132301	2
Caelo	Fructose	14096205	4
Phoenix Goettin	Fructose	14E01-B04-293505	2
Euro OTC	Fructose	1509037-01	8
Caelo	Fructose	15A16-B07-305241	1
Jenne	Fructose	1607030-01	2
Fagron	Fructose	15I21-B01	3
Caelo	Fructose	11258628	2
Fagron	Fructose	7K21-N12	1
Euro OTC	Fructose	1201017-01	2
phönix,29.10.12	Fructose	1205022-01	1
Euro OTC	Fructose	1205022-01	1
EuRho	Fructose	1212015-01	1
Caelo	Fructose	12132313	5
Caelo	Fructose	12132325	3
Caelo	Fructose	12132317	2
Fagron	Fructose	12K28-N06	2
Caelo	Fructose	1309213394	1
Fagron	Fructose	508Q-03394	1
Caelo	Fructose	1081501	1
Synopharm	Fructose	202A052	1
Fagron	Fructose	516Q-03394	1
Caelo	Fructose	5061503	1
Caelo	Fructose	7051304	1
Caelo	Fructose	7111401	1
Lihn/Reformhaus	Fructose	713E-03394	2
Caelo	Fructose	9031504	1
Caelo	Fructose	10051401	1
Caelo	Fructose	10071201	1
Caelo	Fructose	10381013	1
Caelo	Fructose	10381011	1
Caelo	Fructose	11071201	1
Gehe	Fructose	11/07-N08	1
Anzag	Fructose	10381013	1
Caelo	Fructose	11258614	2

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†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Supplier	Substance	Batch	Spectra
Caelo	Fructose	1114A03394	1
Caelo	Fructose	11258611	1
Caelo	Fructose	11258627	3
Fagron	Fructose	1170	1
Euro OTC	Fructose	1209010-01	3
anzag am 12.06.2012	Fructose	1201017-01	1
Noweda	Fructose	1205022-01	1
Euro OTC	Fructose	121201-01pzn	2
Euro OTC	Fructose	1212015-01	6
euroct/gehe	Fructose	1212015-01	1
Anzag 05.03.13	Fructose	12132301	1
Ichthyol, Noweda	Fructose	12132301	1
Caelo	Fructose	12132305	6
Caelo	Fructose	12132309	2
Caelo	Fructose	12132310	1
Caelo	Fructose	12132314	5
Caelo	Fructose	12132320	1
Caelo	Fructose	12132322	3
Caelo	Fructose	121e29-n08	1
Fagron	Fructose	12A26-N04	1
VDL	Fructose	12A26-N04	1
Gehe	Fructose	12B02-N07	1
Gehe	Fructose	12E29-N08	4
Fagron	Fructose	12E29-N08	5
Fagron	Fructose	12H01-N03	3
Gehe	Fructose	12K28-N06	1
Phönix	Fructose	12K28-N06	1
Caelo	Fructose	13021304	1
Euro OTC	Fructose	1307022-01	6
Phoenix 22.12.14	Fructose	1307022-01	1
Caelo	Fructose	13098901	1
Caelo	Fructose	13098902	3
Caelo	Fructose	13098904	1
Caelo	Fructose	13098906	4
Fagron	Fructose	13098906	1
Caelo	Fructose	13098909	1
Caelo	Fructose	13098911	1
Caelo	Fructose	13098913	4
GEHE 17.06.2014	Fructose	13098913	1
Caelo	Fructose	13098914	3
Caelo	Fructose	13098915	1
Caelo	Fructose	13098917	3
Caelo	Fructose	13098918	1
Caelo	Fructose	13098922	1
Caelo	Fructose	130998922	1
Fagron	Fructose	1312A-03394	1
Phönix	Fructose	13A28-N01	2
Fagron	Fructose	13A28-N01	11
13.08.13	Fructose	13A28-N01	1
fargon	Fructose	13C25-N03	1
Fagron	Fructose	13C25-N03	3
Alliance Health 13.02.2...	Fructose	13C25-NO3	1
Fagron	Fructose	13E27-N07	3
Caelo	Fructose	13E27-N07	1
Fagron	Fructose	13E27-n07	1
Fagron	Fructose	13J18-B06	4
Fagron	Fructose	13J18-B06-286894	1
Caelo	Fructose	13J18-B06-286896	1
Gehe	Fructose	13J18-B06-286896	1
Fagron	Fructose	13J18-B06-286899	1

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Supplier	Substance	Batch	Spectra
Fagron	Fructose	13j18B06286896	1
Euro OTC	Fructose	140100401	1
Euro OTC	Fructose	1401004-01	10
Phoenix 22.12.14	Fructose	1401004-01	1
Caelo	Fructose	14096201	4
Caelo	Fructose	14096203	1
Caelo	Fructose	14096208	2
Caelo	Fructose	14096207	1
Caelo	Fructose	14096210	1
Caelo	Fructose	14096219	4
Caelo	Fructose	14096211	1
Caelo	Fructose	14096223	5
Caelo	Fructose	14096224	2
Euro OTC	Fructose	1410009-01	6
Euro OTC	Fructose	141000901	3
Caelo	Fructose	14305203	4
Caelo	Fructose	14305204	1
Fagron	Fructose	14E01-B04	7
Jenne	Fructose	14A16-B07	1
Fagron	Fructose	14E01-B04-29350	1
Fagron	Fructose	14E01-B04-293505	6
Gehe	Fructose	14E01-B04-293506	2
Fagron	Fructose	14E01-B04-293506	2
Fagron	Fructose	14E01B04293506	1
Fagron	Fructose	14E01-B04-297098	2
Fagron	Fructose	14E1-B04-293506	1
Fagron	Fructose	14K17-B99	6
Fagron	Fructose	14k17-B99	2
Phoenix goettin	Fructose	14K17-B99-300913	4
Fagron	Fructose	15/21-B01-323021	1
Fagron	Fructose	15/21-B01	1
Caelo	Fructose	1503045-01	2
Euro OTC	Fructose	1503045-01	8
Caelo	Fructose	15084301	3
Caelo	Fructose	15084305	3
Caelo	Fructose	15084312	2
Caelo	Fructose	1509037-01	2
Euro OTC	Fructose	1512009-01	7
Fagron	Fructose	1521-B01-323021	1
Caelo	Fructose	152711201	1
Caelo	Fructose	15271201	1
Caelo	Fructose	15271205	5
Caelo	Fructose	15271209	1
Caelo	Fructose	15271208	1
Caelo	Fructose	15271213	6
Caelo	Fructose	15271215	1
Gatt Koller	Fructose	1544/05141914	1
Caelo	Fructose	15271214	2
Caelo	Fructose	15A16-B07	1
Fagron	Fructose	15A16-B07	3
Jenne	Fructose	15A16-B07	1
Fagron	Fructose	15A16-B07-303124	1
Fagron	Fructose	15A16-B07-305241	1
Fagron	Fructose	15A16-B07-308950	1
Phoenix	Fructose	15I21-B01	1
Fargon	Fructose	15I21-B01-312701	1
Fagron	Fructose	15I21-B01-312701	1
Fagron	Fructose	15I21-B01-323020	1
Fagron	Fructose	15I21-B01-323021	5
Fagron	Fructose	15l21-B01-312701	1

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Supplier	Substance	Batch	Spectra
Fagron	Fructose	15121-B01-323021	1
Ebert & Jacobi 08.08.16	Fructose	1604024-01	1
EuRho/Noweda	Fructose	1604024-01	1
Euro OTC	Fructose	1604024-01	2
Caelo	Fructose	16066101	1
Caelo	Fructose	16066103	3
Caelo	Fructose	16066106	6
Caelo	Fructose	16066107	4
Euro OTC	Fructose	1607030-01	8
Euro OTC	Fructose	1610033-01	6
Caelo	Fructose	1610033-01	2
Caelo	Fructose	16283910	1
Fagron	Fructose	16H05-B01	2
Fagron	Fructose	16H05-B01-330164	2
Caelo	Fructose	17007702	1
Caelo	Fructose	17007708	1
Caelo	Fructose	170104901	1
Euro OTC	Fructose	1701049-01	1
Caelo	Fructose	18021501	1
Euro OTC	Fructose	1705002-01	1
Caelo	Fructose	21051303	1
Fagron	Fructose	3014Q-03394	1
Caelo	Fructose	20081402	1
Caelo	Fructose	31031401	1
Gatt-Koller / Phoenix	Fructose	3156/0813	1
Euro OTC	Fructose	AD16C91215	1
Caelo	Fructose	3313U-03394	1
Phoenix 05.08.2014	Fructose	FR1336122	3
fragon	Fructose	FR1413072	1
Fagron	Fructose	FR1413072	1
Fagron	Fructose	FR1443072	8
Caelo	Fructose	Fructose2	1
Caelo	Fructose	Fructose1	1
Gehe	Fructose	K43298821	1
Fagron	Fructose	K43298821	2
Sanacorp	Fructose	K43537721	1
Fagron	Fructose	K43537721	1
Caelo	Fructose	13A28-N01	1
Caelo	Fructose	12H01-N03	1
Caelo	Fructose	14305201	1
Caelo	Fructose	14305206	1
Caelo	Fructose	15084308	1
Caelo	Fructose	15084311	1
Caelo	Fructose	11I07-N06	1
Fagron	Fructose	1107-N06	1
Caelo	Fructose	13C25-N03	2
Fagron	Fructose	13J18-B06-286896	1
Beiersdorf	Fructose	14096208	1

- 76 736 spectra from 463 *Apo-Ident* customers from a total of 25 386 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

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Validation results

The validation runs checked whether the substance/substance group *Fructose* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Fructose* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	240	0	72 193
Type B	0	506	0	161 567
Type C	0	422	1	76 736

The substance/substance group *Fructose* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.5000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 98.8142 %)
Type C	100.0000 % (> 99.8849 %)	99.7636 % (> 99.0544 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21281	22986	6.53	37.93
21934	21934	0.00	31.77
22292	22292	0.00	43.61
22481	22481	0.00	40.01
22490	22292	3.39	41.71
22986	22986	0.00	40.07

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Furosemide**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20944-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Furosemide; Furosemidum

Special notes

When selecting the *Furosemide* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Furosemide*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Furosemide	13A22-N08	20944	40	1401379
Fagron	Furosemide	14K10-B02-301746	21819	40	20141215
Fagron	Furosemide	17D06-B01-338982	23940	40	20170626

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Furosemide*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 140 spectra from 4 reference samples of the substance/substance group *Furosemide*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Furosemide	11B18-N04	20241	40
Fagron	Furosemide	14K10-B02-301746	21819†	20
Fagron	Furosemide	16B15-B06-322860	23083	40
Fagron	Furosemide	16B15-B06-322860	23084	40

- 161 933 spectra from a total of 3496 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 18 spectra from 14 *Apo-Ident* customers from 14 batches from the substance/substance group *Furosemide*.

- These include spectra of independent samples from 13 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Furosemide	1095H2RI	1
Fagron	Furosemide	11K21-N26	1
IPCA/Noweda	Furosemide	11D29-N08	1
Alliance Healthcare/Hed…	Furosemide	12/13-N06	1
Fagron	Furosemide	12A18-N03	1
Fagron	Furosemide	12I13-No6	1
Phönix	Furosemide	12a18-n03	1
Fagron	Furosemide	13A22-N08	4
Fagron	Furosemide	13E28-B40-295538	1
Fagron	Furosemide	13E28-B40	2
Fagron	Furosemide	13E28-B40-289433	1
Fagron	Furosemide	15L10-B02-316506	1
Caelo	Furosemide	16B15-B06	1
Fagron	Furosemide	17d06-b01-335672	1

- 77 141 spectra from 463 *Apo-Ident* customers from a total of 25 534 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Furosemide* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Furosemide* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	140	0	161 933
Type C	0	18	0	77 141

The substance/substance group *Furosemide* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 95.7143 %)
Type C	100.0000 % (> 99.8850 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several

new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20944	20944	0.00	66.39
21819	20944	6.90	64.68
23940	20944	6.79	64.53

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Fusidic acid**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20780-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Fusidic acid; Acidum fusidicum; Acidum fusidinicum

Special notes

When selecting the *Fusidic acid* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Fusidic acid*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Fusidic acid	12G04-N01	20780	40	1401162
Fagron	Fusidic acid	13L13-B01-289513	21733	40	20140113
Fagron	Fusidic acid	14E01-B08-299791	21897	40	20140605

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Fusidic acid*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 120 spectra from 4 reference samples of the substance/substance group *Fusidic acid*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Fusidic acid	13L13-B01-289513	21733†	20
Fagron	Fusidic acid	14E01-B08-299791	21897†	20
Fagron	Fusidic acid	15I10-B02-322112	23069	40
Fagron	Fusidic acid	17J06-B02-343675	23943	40

- 161 953 spectra from a total of 3495 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 30 spectra from 10 *Apo-Ident* customers from 23 batches from the substance/substance group *Fusidic acid*.

- These include spectra of independent samples from 21 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Fusidic acid	4113U-07034	1
Fagron	Fusidic acid	13L13-B01	1
Fagron	Fusidic acid	13L13-B01-289513	3
Fagron	Fusidic acid	13L13-B01-289514	1
Fagron	Fusidic acid	14E01-B08-299791	4
Fagron	Fusidic acid	116E-03682	1
Fagron	Fusidic acid	15/10-b02	2
Fagron	Fusidic acid	15/10-B02-314192	1
Ebert 24.08.16	Fusidic acid	1510-B02319452	1
Fagron	Fusidic acid	1510-B02319231	1
Fagron	Fusidic acid	15I10-B02	1
Fagron	Fusidic acid	15I10-B02-314192	1
Fagron	Fusidic acid	15I10-B02-317688	1
Fagron	Fusidic acid	15I10-B02-314545	1
Fagron	Fusidic acid	15I10-B02-317697	1
Fagron	Fusidic acid	15I10B02-319231	1
Fagron	Fusidic acid	15I10-B02-322112	1
Fagron	Fusidic acid	15I10-B02-326182	1
Fagron	Fusidic acid	17G06-B99-337953	1
Fagron	Fusidic acid	12B23-N03	1
Fagron	Fusidic acid	12G04-No1	1
Fagron	Fusidic acid	13A07-N10	2
Fagron	Fusidic acid	13H19-N05	1

- 77 129 spectra from 463 *Apo-Ident* customers from a total of 25 524 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Fusidic acid* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Fusidic acid* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	119	1	161 953
Type C	0	28	2	77 129

The substance/substance group *Fusidic acid* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	99.1667 % (> 96.6667 %)
Type C	100.0000 % (> 99.8850 %)	93.3333 % (> 83.3333 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20780	20780	0.00	30.59
21733	20780	4.51	29.39
21897	20780	14.43	27.96

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Gelatine, white**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20206-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Gelatine, white; Gelatina alba

Special notes

When selecting the *Gelatine, white* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Gelatine, white*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Gelatine, white	11334025	20898	40	20111214
Caelo	Gelatine, white	15320504	22499	40	AR-16-FG-014461-01
Caelo	Gelatine, white	15320504	22582	40	AR-16-FG-011564-01

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Gelatine, white*. These samples are listed above in the section *calibration samples*. The reference samples originate from 2 different batches.

- 72 313 spectra from a total of 1580 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 125 spectra from 4 reference samples of the substance/substance group *Gelatine, white*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Gelatine, white	10051107	20206	40
Caelo	Gelatine, white	15320504	22582†	5
Caelo	Gelatine, white	172772	23792	40
Caelo	Gelatine, white	154419	23793	40

- 161 948 spectra from a total of 3495 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 23 spectra from 16 *Apo-Ident* customers from 16 batches from the substance/substance group *Gelatine, white*.

- These include spectra of independent samples from 14 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
EuRho / 20	Gelatine, white	1106021-01	1
Caelo	Gelatine, white	14130901	2
Caelo	Gelatine, white	15084806	1
Caelo	Gelatine, white	15320504	1
Caelo	Gelatine, white	15084801	1
Caelo	Gelatine, white	11019308	1
Caelo	Gelatine, white	14130912	1
Caelo	Gelatine, white	11019319	1
Caelo	Gelatine, white	11019322	1
Euro OTC	Gelatine, white	1106021-01	2
Caelo	Gelatine, white	11314516	1
Caelo	Gelatine, white	11334020	1
Caelo	Gelatine, white	11334025	3
Caelo	Gelatine, white	12354401	1
Phönix 13.05.2013	Gelatine, white	12332564	1
Caelo	Gelatine, white	12354507	3
Caelo	Gelatine, white	4110I-01578	1

- 77 136 spectra from 463 *Apo-Ident* customers from a total of 25 533 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Gelatine, white* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Gelatine, white* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	87	38	161 948
Type C	0	16	7	77 136

The substance/substance group *Gelatine, white* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	69.6000 % (> 67.2000 %)
Type C	100.0000 % (> 99.8850 %)	69.5652 % (> 56.5217 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20898	22582	6.54	20.15
22499	22499	0.00	18.28
22582	22582	0.00	18.72

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Gentamicin sulfate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20640-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Gentamicin sulfate; Gentamicin sulphate; Gentamicini sulfas; Gentamycinum sulfuricum

Special notes

When selecting the *Gentamicin sulfate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Gentamicin sulfate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Gentamicin sulfate	12B21-N02	20661	40	1411075
Euro OTC	Gentamicin sulfate	1305047-01	21081	40	20130919
Caelo	Gentamicin sulfate	13205003	21580	40	20130723
Euro OTC	Gentamicin sulfate	1305047-03	21582	40	1411076
Fagron	Gentamicin sulfate	14E08-B03-294848	21684	40	20140616

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Gentamicin sulfate	1506016	21837	40	0000010321
Caelo	Gentamicin sulfate	14353504	22604	40	20150119
Euro OTC	Gentamicin sulfate	1610036	22857	40	20161124*
Fagron	Gentamicin sulfate	16B29-B01-328731	23210	40	20160411
Euro OTC	Gentamicin sulfate	1610036-01	23782	40	1804343
Euro OTC	Gentamicin sulfate	1711025	23882	40	20171206*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 440 spectra of 11 reference samples from the substance/substance group *Gentamicin sulfate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 11 different batches.

- 71 993 spectra from a total of 1571 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 635 spectra from 16 reference samples of the substance/substance group *Gentamicin sulfate*.

- These include spectra of independent samples from 8 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Gentamicin sulfate	73402189	20008	50
Caelo	Gentamicin sulfate	09115106	20108	40
Euro OTC	Gentamicin sulfate	2911034-01	20223	40

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*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Gentamicin sulfate	11113309	20640	40
zu erfassen	Gentamicin sulfate	zu erfassen	21016	20
Fagron	Gentamicin sulfate	13I19-B05-286565	21578	60
Caelo	Gentamicin sulfate	13205003	21580†	20
Euro OTC	Gentamicin sulfate	1305047-03	21582†	20
Fagron	Gentamicin sulfate	14E08-B03-294848	21684†	20
Euro OTC	Gentamicin sulfate	1305047-03	21697	45
Euro OTC	Gentamicin sulfate	1506016	21837†	20
Euro OTC	Gentamicin sulfate	1604054	22568	40
Caelo	Gentamicin sulfate	170996	23335	40
Fagron	Gentamicin sulfate	13I19-B05-286565	21578SI	60
Caelo	Gentamicin sulfate	13205003	21580SI	60
Euro OTC	Gentamicin sulfate	1506016	21837SI	60

- 161 438 spectra from a total of 3488 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 630 spectra from 271 *Apo-Ident* customers from 176 batches from the substance/substance group *Gentamicin sulfate*.

- These include spectra of independent samples from 166 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Euro OTC	Gentamicin sulfate	4988304	1
Caelo	Gentamicin sulfate	7011505	1
Euro OTC	Gentamicin sulfate	1205021-01	12
Euro OTC	Gentamicin sulfate	1205021-02	22
Caelo	Gentamicin sulfate	12146602	9
Caelo	Gentamicin sulfate	12146604	6
Fagron	Gentamicin sulfate	12D26-N05	11
Fargron/AHD	Gentamicin sulfate	12G04-N16	1
Fujian Fukang Pharmaceu...	Gentamicin sulfate	12G04-N16	2
Fagron	Gentamicin sulfate	13/19-B05	1
Fagron	Gentamicin sulfate	13/19-B05-286568	1
Noweda	Gentamicin sulfate	1305005	1
Bombastus	Gentamicin sulfate	13024-N05	1
PHOENIX 10.03.2014	Gentamicin sulfate	1305047	1
Euro OTC	Gentamicin sulfate	1305047	1
Gehe am 24.2.14	Gentamicin sulfate	1305047-01	1
Euro OTC	Gentamicin sulfate	1305047-01	14
Caelo	Gentamicin sulfate	1305047-03(2mal)	1

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†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Supplier	Substance	Batch	Spectra
Euro OTC	Gentamicin sulfate	1305047-03	12
Euro OTC	Gentamicin sulfate	130504703	2
Euroo/Phoenix	Gentamicin sulfate	1305047-03	1
Phoenix	Gentamicin sulfate	1305047-03	1
Anzag	Gentamicin sulfate	1305047-03	1
Caelo	Gentamicin sulfate	1305047-03	3
Sanacorp 06.01.15 EK 6,20	Gentamicin sulfate	1305047-03	1
Sanacorp	Gentamicin sulfate	1305047-03	1
Caelo	Gentamicin sulfate	13189606	7
Herbasinica	Gentamicin sulfate	13189608	1
Sanacorp	Gentamicin sulfate	13189608	1
Caelo	Gentamicin sulfate	13189608	4
Phönix	Gentamicin sulfate	13189611	1
Phönix Gotha	Gentamicin sulfate	13189611	1
Caelo	Gentamicin sulfate	13189611	10
Noweda	Gentamicin sulfate	13189611	1
Caelo	Gentamicin sulfate	13189612	15
Noweda	Gentamicin sulfate	13189612	1
Caelo	Gentamicin sulfate	13189613	1
Caelo	Gentamicin sulfate	13189614	2
Fagron	Gentamicin sulfate	1319-B05-286565	1
Caelo	Gentamicin sulfate	13205003	8
AHD 29.10.14 EK6,12	Gentamicin sulfate	13205004	1
Caelo	Gentamicin sulfate	13205004	1
Caelo	Gentamicin sulfate	13205005	12
AHD	Gentamicin sulfate	13205005	2
Caelo	Gentamicin sulfate	13205006	5
Caelo	Gentamicin sulfate	13205007	2
Fagron	Gentamicin sulfate	13D24-N05	10
Fagron	Gentamicin sulfate	13f13-N01	1
Fagron	Gentamicin sulfate	13I19-B05	1
Caelo	Gentamicin sulfate	13I19-B05-286565	1
Anzag	Gentamicin sulfate	1407024-01	1
Euro OTC	Gentamicin sulfate	1407024	1
Euro OTC	Gentamicin sulfate	1407024-01	3
Euro	Gentamicin sulfate	1407024-01	1
Euro OTC	Gentamicin sulfate	1407024-02	1
Euro OTC	Gentamicin sulfate	1407024-03	2
Euro OTC	Gentamicin sulfate	140702403	1
Euro OTC	Gentamicin sulfate	140702404	3
Noweda	Gentamicin sulfate	140702404	1
Euro OTC	Gentamicin sulfate	1407024-04	7
Euro OTC	Gentamicin sulfate	1407024-4	1
Fagron	Gentamicin sulfate	14081307	2
Caelo	Gentamicin sulfate	14081307	1
Caelo	Gentamicin sulfate	143533504	1
Caelo	Gentamicin sulfate	14353502	2
Caelo	Gentamicin sulfate	14353503	12
Caelo	Gentamicin sulfate	14353504	7
Noweda	Gentamicin sulfate	14353504	1
Caelo	Gentamicin sulfate	14353505	3
Fagron	Gentamicin sulfate	14A30-B04	2
Fagron	Gentamicin sulfate	14A30-B04-290861	3
Fujian Fukang Pharmacea...	Gentamicin sulfate	14A30-B04-290861	1
Fagron	Gentamicin sulfate	14E08-B03	2
Fagron	Gentamicin sulfate	14E08-B03-294835	2
Caelo	Gentamicin sulfate	14E08-B03-294841	1
Fagron	Gentamicin sulfate	14E08-B03-294841	2
Fujian Fukang Pharmaceu...	Gentamicin sulfate	14E08-B03-294848	1
Fagron	Gentamicin sulfate	14E08-B03-294848	3

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Supplier	Substance	Batch	Spectra
Fagron	Gentamicin sulfate	14E08-B03-300619	1
Fagron	Gentamicin sulfate	14e08b03300619	1
Fujian Fukang Pharmacea...	Gentamicin sulfate	14E08-B03-300619	1
Fagron	Gentamicin sulfate	14K28-B06	3
Yantai Justaware Pharma...	Gentamicin sulfate	14K28-B06	1
Fagron	Gentamicin sulfate	14K28-B06-301951	1
Caelo	Gentamicin sulfate	14K28-B06-303636	1
Fagron	Gentamicin sulfate	14K28-B06-303640	3
Fagron	Gentamicin sulfate	14k28-b06-303640	2
Caelo	Gentamicin sulfate	14K28-B06-303646	3
Fagron	Gentamicin sulfate	14K28-B06-303646	4
Fagron	Gentamicin sulfate	14K28B06303646	2
Caelo	Gentamicin sulfate	1506016-01	2
Euro OTC	Gentamicin sulfate	1506016-01	10
Euro OTC	Gentamicin sulfate	150601601	1
Euro OTC	Gentamicin sulfate	1506016-02	24
Euro OTC	Gentamicin sulfate	150601602	2
AHD /Pharmachem Pößneck	Gentamicin sulfate	1506016-02	1
Caelo	Gentamicin sulfate	15226501	10
Phoenix	Gentamicin sulfate	15226501	1
Caelo	Gentamicin sulfate	15226502	11
Phoenix	Gentamicin sulfate	15226502	1
Caelo	Gentamicin sulfate	15226508	2
PHÖNIX	Gentamicin sulfate	15226514	1
Caelo	Gentamicin sulfate	15226514	3
Gehe	Gentamicin sulfate	15226517	1
Caelo	Gentamicin sulfate	15226518	2
Caelo	Gentamicin sulfate	15258802	11
Fagron	Gentamicin sulfate	15258802	1
Caesar&Loretz GmbH,25.0...	Gentamicin sulfate	15258802	1
Caelo	Gentamicin sulfate	15258803	8
Caelo	Gentamicin sulfate	15258806	1
Sanacorp	Gentamicin sulfate	15258808	1
Caelo	Gentamicin sulfate	15258808	2
Caelo	Gentamicin sulfate	15258809	1
Caelo	Gentamicin sulfate	15258810	6
Caelo	Gentamicin sulfate	15258813	3
Caelo	Gentamicin sulfate	15258815	2
Caelo	Gentamicin sulfate	15258816	4
Phoenix	Gentamicin sulfate	15258816	1
Caelo	Gentamicin sulfate	15258818	2
Caelo	Gentamicin sulfate	15258819	1
Fagron	Gentamicin sulfate	15B03-B07	1
Caelo	Gentamicin sulfate	15258822	1
Fagron	Gentamicin sulfate	15B03-B07-309482	1
Fagron	Gentamicin sulfate	15b03-b07-309482	1
Caelo	Gentamicin sulfate	15B03-B07-309482	1
Fagron	Gentamicin sulfate	15E04-B05-316255	2
Fagron	Gentamicin sulfate	15G29-B09-320305	3
Fagron	Gentamicin sulfate	15G29-B09-322928	1
Fagron	Gentamicin sulfate	15G29-B09-322945	1
Euro OTC	Gentamicin sulfate	1604054-01	9
Euro OTC	Gentamicin sulfate	16004054-01	1
Fagron	Gentamicin sulfate	15G29-B09-326632	1
Euro OTC	Gentamicin sulfate	16004054-02	1
Caelo	Gentamicin sulfate	1604054-01	2
Eurimpharm1	Gentamicin sulfate	1604054-01	1
Euro OTC	Gentamicin sulfate	1604054-02	4
Caelo	Gentamicin sulfate	1610036-01	1
Euro OTC	Gentamicin sulfate	1610036-01	6

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Supplier	Substance	Batch	Spectra
Euro OTC	Gentamicin sulfate	161003601	1
Fagron	Gentamicin sulfate	16B29-B01-328731	2
Caelo	Gentamicin sulfate	16B29-B01-328731	1
Phoenix	Gentamicin sulfate	16b29-b01-328731	1
Caelo	Gentamicin sulfate	17081502	1
Caelo	Gentamicin sulfate	17099603	1
Fagron	Gentamicin sulfate	19-B05-286568	1
Caelo	Gentamicin sulfate	17099608	1
Caelo	Gentamicin sulfate	20161102-4	1
Caelo	Gentamicin sulfate	23012015E	1
Sanacorp	Gentamicin sulfate	28/AKD11	1
Caelo	Gentamicin sulfate	4563125	1
Caelo	Gentamicin sulfate	31032014E	1
Caelo	Gentamicin sulfate		2
Fagron	Gentamicin sulfate	FG1212646	1
Fagron	Gentamicin sulfate	FG1305122	1
Fagron	Gentamicin sulfate	11K21-N17	2
Caelo	Gentamicin sulfate	1205021-01	1
Caelo	Gentamicin sulfate	1216602	1
Caelo	Gentamicin sulfate	12G04-N16	2
Euro OTC	Gentamicin sulfate	FG11112482	1
Sanacorp	Gentamicin sulfate	13189606	1
Caelo	Gentamicin sulfate	13189607	11
Fagron	Gentamicin sulfate	13I19-B05-286568	1
Fagron	Gentamicin sulfate	14A30-B04-290858	1
Fagron	Gentamicin sulfate	11604054-01	1
EuRho	Gentamicin sulfate	1305047-01	1
Caelo	Gentamicin sulfate	1435303	1
Caesar & Loretz GmbH	Gentamicin sulfate	14353503	1
Fagron	Gentamicin sulfate	14a30-b04-290858	1
Fagron	Gentamicin sulfate	14k28-B06-303640	1
Caesar&Loretz GmbH	Gentamicin sulfate	15226501	1
Fagron	Gentamicin sulfate	15803-B07-309482	1
AHD Lamotte GmbH	Gentamicin sulfate	1604054-02	1
Caelo	Gentamicin sulfate	3714I-01582	1
Caelo	Gentamicin sulfate	6082013C	1
Euro OTC	Gentamicin sulfate	80616-2	1
Caelo	Gentamicin sulfate	9115112	1
Caelo	Gentamicin sulfate	100017814	1
Phönix Gotha	Gentamicin sulfate	10017817	1
Caelo	Gentamicin sulfate	10017820	1
Euro OTC	Gentamicin sulfate	1007036-03	1
Fagron	Gentamicin sulfate	10A29-N06	1
Fagron	Gentamicin sulfate	11/09N10	1
Fagron	Gentamicin sulfate	11/09-N10	1
Euro OTC	Gentamicin sulfate	1106016-01	6
Noweda	Gentamicin sulfate	1106016-01	1
Caelo	Gentamicin sulfate	1106016-01	1
Fagron	Gentamicin sulfate	1106016-01	1
Euro OTC	Gentamicin sulfate	1106016-02	3
Euro OTC	Gentamicin sulfate	1106016-03	3
Caelo	Gentamicin sulfate	1106016-03	1
Euro OTC	Gentamicin sulfate	110616-01	1
Caelo	Gentamicin sulfate	111113309	1
Caelo	Gentamicin sulfate	11113303	2
Caelo	Gentamicin sulfate	11113304	4
Caelo	Gentamicin sulfate	11113308	5
Phönix	Gentamicin sulfate	11113309	1
phönix, 19.11.2012	Gentamicin sulfate	1160616-03	1
Fagron	Gentamicin sulfate	11k21-n17	3

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Supplier	Substance	Batch	Spectra
Großhandel	Gentamicin sulfate	11K21-N17	1
Sanacorp	Gentamicin sulfate	1205021	1
Gehe	Gentamicin sulfate	1205021-01	1
Bombastus	Gentamicin sulfate	1205021-01	1
Gehe	Gentamicin sulfate	1205021-02	1
Caelo	Gentamicin sulfate	1205021-02	3
Fagron	Gentamicin sulfate	1205021-02	3
Euro OTC	Gentamicin sulfate		1
phönix	Gentamicin sulfate	1214605	1
Anzag	Gentamicin sulfate	12146602	1
Noweda	Gentamicin sulfate	12146602	1
vdl	Gentamicin sulfate	12146602	1
Phönix	Gentamicin sulfate	12146602	1
Gehe	Gentamicin sulfate	12146604	1
Caelo	Gentamicin sulfate	12146605	6
Gehe	Gentamicin sulfate	12146605	1
Phönix Gotha	Gentamicin sulfate	12146611	1
Caelo	Gentamicin sulfate	12146611	12
Caelo	Gentamicin sulfate	12146612	4
Caelo	Gentamicin sulfate	12163204	5
Caelo	Gentamicin sulfate	12163206	1
Phönix Gotha	Gentamicin sulfate	12163207	1
Caelo	Gentamicin sulfate	12163207	4
Caelo	Gentamicin sulfate	12163209	1
Fagron	Gentamicin sulfate	1221-n02	1
Fagron	Gentamicin sulfate	12B21-N02	2
Anzag 06.09.2012	Gentamicin sulfate	12D26-N05	1
Phoenix	Gentamicin sulfate	12D26-N05	1
Fagron	Gentamicin sulfate	12D26N05	1
Fagron	Gentamicin sulfate	12D6-N05	1
Kehr	Gentamicin sulfate	12G04-N16	1
Fagron	Gentamicin sulfate	12G04-N16	1
Fagron	Gentamicin sulfate	12g04-n16	1
Alliance Healthcare	Gentamicin sulfate	12G04-N16	1
Fagron	Gentamicin sulfate	12117-no2	1
Euro OTC	Gentamicin sulfate	130504701	1
Caelo	Gentamicin sulfate	13091207	1
Caelo	Gentamicin sulfate	13189602	6
Phönix/Maros	Gentamicin sulfate	13189602	1
Caelo	Gentamicin sulfate	13189603	3
Caelo	Gentamicin sulfate	13189605	1
Fagron	Gentamicin sulfate	13189607	1
Noweda	Gentamicin sulfate	13189607	1
Caelo	Gentamicin sulfate	13D24-N05	1
Caelo	Gentamicin sulfate	1710I-01582	1
Fagron	Gentamicin sulfate	20100512-3	1
Euro OTC	Gentamicin sulfate	2911034-02	1
Caelo	Gentamicin sulfate	312012	1
Caelo	Gentamicin sulfate	3110806	1
Caelo	Gentamicin sulfate	32131-01582	1
Caelo	Gentamicin sulfate	73402189	1
EuRho	Gentamicin sulfate	FG1112482	1
Sanacorp	Gentamicin sulfate	13189607	1
Fargon	Gentamicin sulfate	13D24-N05	1

- 76 529 spectra from 463 *Apo-Ident* customers from a total of 25 375 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are docu-

mented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Gentamicin sulfate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Gentamicin sulfate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	440	0	71 993
Type B	0	444	191	161 438
Type C	0	584	46	76 529

The substance/substance group *Gentamicin sulfate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9887 %)	100.0000 % (> 98.6364 %)
Type B	100.0000 % (> 99.9928 %)	69.9213 % (> 69.4488 %)
Type C	100.0000 % (> 99.8849 %)	92.6984 % (> 92.2222 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20661	20661	0.00	19.24
21081	21837	5.98	29.07
21580	21837	5.82	32.41
21582	21582	0.00	26.10
21684	21837	3.05	25.33
21837	21837	0.00	31.18
22604	21837	9.97	29.96
22857	22857	0.00	24.23
23210	21837	4.76	27.50
23782	23782	0.00	27.04
23882	23882	0.00	26.37

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Glucose monohydrate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20031-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Glucose monohydrate; Glucosum monohydricum; Saccharum amylaceum

Special notes

When selecting the *Glucose monohydrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Glucose monohydrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Glucose monohydr…	11L19-N13	20799	40	20120105
Fagron	Glucose monohydr…	14B04-B01	21274	40	20140304
Euro OTC	Glucose monohydr…	1509006	21905	40	20150914*
Euro OTC	Glucose monohydr…	1601016	22308	40	20160129*
Euro OTC	Glucose monohydr…	1604006	22538	40	20160511*
Euro OTC	Glucose monohydr…	1701002	23006	40	20170213*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 240 spectra of 6 reference samples from the substance/substance group *Glucose monohydrate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 6 different batches.

- 72 193 spectra from a total of 1576 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 395 spectra from 10 reference samples of the substance/substance group *Glucose monohydrate*.

- These include spectra of independent samples from 8 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Glucose monohydrate	82246219	20031	75
Euro OTC	Glucose monohydrate	1210034-02	21285	40
Euro OTC	Glucose monohydrate	1509006	21905†	20
Euro OTC	Glucose monohydrate	1601016	22308†	20
Euro OTC	Glucose monohydrate	1607024	22692	40
Caelo	Glucose monohydrate	16184807	23025	40
Caelo	Glucose monohydrate	171368	23304	40
Euro OTC	Glucose monohydrate	1707004	23545	40
Caelo	Glucose monohydrate	173050	23802	40
Euro OTC	Glucose monohydrate	1801009	23897	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 678 spectra from a total of 3489 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 1039 spectra from 217 *Apo-Ident* customers from 251 batches from the substance/substance group *Glucose monohydrate*.

- These include spectra of independent samples from 246 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Noweda	Glucose monohydrate	1210034	1
EuRho	Glucose monohydrate	1204044-01	2
Caelo	Glucose monohydrate	12284229	6
Caelo	Glucose monohydrate	13157007	8
Euro OTC	Glucose monohydrate	2313E-02209	1
EuRho	Glucose monohydrate	2710Q-02209	1
Dextro Energy GmbH/Sana...	Glucose monohydrate	L1299	1
Dextro Energy GmbH/Krie...	Glucose monohydrate		1
Dextro Energy	Glucose monohydrate	13171	1
Dextro EnergyGmbH	Glucose monohydrate	L4036	1
Dextro Energy GmbH/Gehe	Glucose monohydrate	L4163	2
Dextro EnergyGmbH	Glucose monohydrate	L4273	1
Dextro Energy GmbH/Gehe	Glucose monohydrate	L4164	1
Dextro Energy GmbH/Gehe	Glucose monohydrate	L4274	1
Dextro GmbH/Noweda	Glucose monohydrate	L5301	1
Fagron	Glucose monohydrate		1
Euro OTC	Glucose monohydrate	96-01	1
GATT-KOLLER/PHOENIX	Glucose monohydrate	243/02141714	1
Caelo	Glucose monohydrate	2101402	1
GATT-KOLLER/PHOENIX	Glucose monohydrate	243/02142614	1
Eigenherstellung	Glucose monohydrate	40615HJK01	1
Klenk	Glucose monohydrate	4298924	1
Caelo	Glucose monohydrate	5051401	1
Caelo	Glucose monohydrate	11021509	1
Euro OTC	Glucose monohydrate	1103027-01	1
Euro OTC	Glucose monohydrate	1108061-01	3
EuRho	Glucose monohydrate	1108061-01	2
Caelo	Glucose monohydrate	11111111	2
Euro OTC	Glucose monohydrate	1210034-02	9
Euro OTC	Glucose monohydrate	1210034-03	1
Sanacorp	Glucose monohydrate	12284230	1
Caelo	Glucose monohydrate	12284231	1
Euro OTC	Glucose monohydrate	1305030-02	8
Klenk	Glucose monohydrate	13157002	8
Caelo	Glucose monohydrate	13157002	4
Caelo	Glucose monohydrate	13157005	14
Caelo	Glucose monohydrate	13157008	2
Caelo	Glucose monohydrate	13157011	14

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Supplier	Substance	Batch	Spectra
Caelo	Glucose monohydrate	13157012	1
Caelo	Glucose monohydrate	13157013	1
Cealo	Glucose monohydrate	13157017	1
Caelo	Glucose monohydrate	13157019	10
Gehe	Glucose monohydrate	13157026	2
Caelo	Glucose monohydrate	13157026	3
sanacorp	Glucose monohydrate	13157026	1
Fagron	Glucose monohydrate	13B01-N03	5
Caelo	Glucose monohydrate	13H06-N08	2
Fagron	Glucose monohydrate	13H06-N08	18
Euro OTC	Glucose monohydrate	1401019-01	17
Euro OTC	Glucose monohydrate	140004-01	1
Euro OTC	Glucose monohydrate	14005004-02	1
Fagron	Glucose monohydrate	13H14-B06-289483	1
Phönix Gotha	Glucose monohydrate	1401019-01	1
Fagron	Glucose monohydrate	1401019-01	1
gehe	Glucose monohydrate	1401019-02	1
Euro OTC	Glucose monohydrate	140101902	2
Ph.Eur.8.0	Glucose monohydrate	1401019-02	1
Euro OTC	Glucose monohydrate	1401019-02	1
Euro OTC	Glucose monohydrate	1405004-01	16
Euro OTC	Glucose monohydrate	140500401	2
Sonnenberg-Apotheke	Glucose monohydrate	140500401	1
EuRho/Phoenix	Glucose monohydrate	140500401	1
Euro OTC	Glucose monohydrate	1405004-02	5
Phönix Gotha	Glucose monohydrate	1405004-02	1
Euro OTC	Glucose monohydrate	140500402	1
Fagron	Glucose monohydrate	1407-808-307707	1
Euro OTC	Glucose monohydrate	1410019-01	9
Euro OTC	Glucose monohydrate	141001901	1
EuRho/GEHE	Glucose monohydrate	1410019-01	1
Euro OTC	Glucose monohydrate	1410019-02	4
Caelo	Glucose monohydrate	1410019-02	1
Caelo	Glucose monohydrate	14102401	6
AHD	Glucose monohydrate	14102407	1
Caelo	Glucose monohydrate	14102407	2
Caelo	Glucose monohydrate	14102411	5
Gehe	Glucose monohydrate	14102411	1
Caelo	Glucose monohydrate	14102412	13
Caelo	Glucose monohydrate	14102415	1
Caelo	Glucose monohydrate	14102416	5
Noweda 06.10.2014	Glucose monohydrate	14102416	1
Caelo	Glucose monohydrate	14102418	9
Gehe	Glucose monohydrate	14102419	1
Caelo	Glucose monohydrate	14102419	1
Caelo	Glucose monohydrate	14102420	5
Caelo	Glucose monohydrate	14102421	7
Caelo	Glucose monohydrate	14102427	2
Caelo	Glucose monohydrate	14102424	1
Cealo	Glucose monohydrate	14102430	1
Caelo	Glucose monohydrate	14102430	3
Sanacorp	Glucose monohydrate	14102430	1
Caelo	Glucose monohydrate	14120419	1
Caelo	Glucose monohydrate	14334801	1
Caelo	Glucose monohydrate	14334802	10
Noweda 10.02.2015	Glucose monohydrate	14334802	3
Bombastus	Glucose monohydrate	14334802	2
Caelo	Glucose monohydrate	14334806	2
Caelo	Glucose monohydrate	14334807	5
Caelo	Glucose monohydrate	14334808	2

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Supplier	Substance	Batch	Spectra
Caelo	Glucose monohydrate	14334809	1
Caelo	Glucose monohydrate	14334810	6
Anzag	Glucose monohydrate	14334810	1
Caelo	Glucose monohydrate	14334811	3
Caelo	Glucose monohydrate	14334812	1
Euro OTC	Glucose monohydrate	145004-01	1
Fagron	Glucose monohydrate	14B04-B01	3
Fagron	Glucose monohydrate	14B04-B01-291137	7
Caelo	Glucose monohydrate	14B04-B01-291137	1
Fagron	Glucose monohydrate	14B04-B01-291138	1
Fagron	Glucose monohydrate	14B04-B01-291143	2
Fagron	Glucose monohydrate	14B28-B02	4
Fagron	Glucose monohydrate	14B28-B02-291353	10
Fagron	Glucose monohydrate	14B28-B02-291354	4
Caelo	Glucose monohydrate	14B28-B02-291354	1
Fagron	Glucose monohydrate	14I04-B08	1
Caelo	Glucose monohydrate	14I04-B08	4
Caelo	Glucose monohydrate		3
Fagron	Glucose monohydrate	14I04-B08-298602	3
Fagron	Glucose monohydrate	14I04B8298602	1
Euro OTC	Glucose monohydrate	1504028-01	16
Euro/ Sanacorp	Glucose monohydrate	1504028-01	1
Euro OTC	Glucose monohydrate	150402801	1
Euro OTC	Glucose monohydrate	1504028-02	5
Euro OTC	Glucose monohydrate	15040281	1
Euro OTC	Glucose monohydrate	1509006-01	17
Euro OTC	Glucose monohydrate	150900601	1
Euro OTC	Glucose monohydrate	1509006-02	3
Euro OTC	Glucose monohydrate	1509006-1	1
Caello/Phönix	Glucose monohydrate	15095601	3
Caelo	Glucose monohydrate	15095601	13
sana	Glucose monohydrate	15095601	2
Euro OTC	Glucose monohydrate	15095601	1
Caelo	Glucose monohydrate	15095603	1
Caelo	Glucose monohydrate	15095602	1
Caelo	Glucose monohydrate	15095605	3
Caelo	Glucose monohydrate	15095611	3
Caelo	Glucose monohydrate	15095612	11
Noweda 30.07.2015	Glucose monohydrate	15095612	1
Caelo	Glucose monohydrate	15180001	12
Caelo	Glucose monohydrate	15180002	15
Caelo	Glucose monohydrate	15180003	3
Caelo	Glucose monohydrate	15180005	3
Caelo	Glucose monohydrate	15180010	6
Euro OTC	Glucose monohydrate	15180010	1
Caelo	Glucose monohydrate	15180012	21
Caelo	Glucose monohydrate	15180013	3
Caesar & Loretz GmbH	Glucose monohydrate	15180013	1
Caelo	Glucose monohydrate	15180015	7
Caelo	Glucose monohydrate	15180016	1
Caelo	Glucose monohydrate	1518002	1
Fagron	Glucose monohydrate	1521-B06-309508	1
Caeolo/Noweda	Glucose monohydrate	15413301	1
Caelo	Glucose monohydrate	15413302	4
Caelo	Glucose monohydrate	15413303	1
Caelo	Glucose monohydrate	15413304	25
Caesa/Phoenix	Glucose monohydrate	15413304	1
Noweda 10.032016	Glucose monohydrate	15413304	2
Caelo	Glucose monohydrate	15413401	5
Caelo	Glucose monohydrate	15413402	4

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Supplier	Substance	Batch	Spectra
Caesar & Loretz GmbH	Glucose monohydrate	15413402	1
Caelo	Glucose monohydrate	15413405	3
Caelo	Glucose monohydrate	15413409	19
Caelo	Glucose monohydrate	15413410	3
Bombastus	Glucose monohydrate	15413410	1
Caelo	Glucose monohydrate	15413412	1
allianz	Glucose monohydrate	1543409	1
Cealo/ Noweda	Glucose monohydrate	15413412	1
Fagron	Glucose monohydrate	15A21-B06-309508	3
Fagron	Glucose monohydrate	15B01291137	1
Euro OTC	Glucose monohydrate	1601016-01	13
Caelo	Glucose monohydrate	1601016-01	1
Euro OTC	Glucose monohydrate	160101601	1
Euro OTC	Glucose monohydrate	1601016-02	4
Euro OTC	Glucose monohydrate	16040060-01	1
Euroo	Glucose monohydrate	1604006-01	1
Euro OTC	Glucose monohydrate	1604006-01	11
Euro/Alliance Healthcare	Glucose monohydrate	1604006-01	1
Euro OTC	Glucose monohydrate	1604006-02	17
Euro/Noweda	Glucose monohydrate	1604006-02	2
Caelo	Glucose monohydrate	16049101	14
phönix	Glucose monohydrate	16049101	1
Alliance	Glucose monohydrate	16049101	1
Caelo	Glucose monohydrate	16049102	5
Caelo	Glucose monohydrate	16049103	1
Caelo	Glucose monohydrate	16049104	10
Caesar & Loretz/Noweda	Glucose monohydrate	16049102	1
phönix	Glucose monohydrate	16049104	1
Caelo	Glucose monohydrate	16049105	5
Caelo	Glucose monohydrate	16049107	2
Euro OTC	Glucose monohydrate	1607024-01	10
Euro OTC	Glucose monohydrate	1607024-02	7
Eigenherstellung	Glucose monohydrate	160915HML01	1
Caelo	Glucose monohydrate	16184801	12
Caelo	Glucose monohydrate	16184802	1
Caelo	Glucose monohydrate	16184807	3
Caelo	Glucose monohydrate	16184808	3
Sanacorp	Glucose monohydrate	16184810	1
Caelo	Glucose monohydrate	16184810	10
Caelo	Glucose monohydrate	16184816	1
phönix	Glucose monohydrate	16184816	1
Caelo	Glucose monohydrate	17005802	4
Caelo	Glucose monohydrate	17136802	1
Caelo	Glucose monohydrate	17005801	1
Caelo	Glucose monohydrate	17005803	5
Caelo	Glucose monohydrate	17005804	3
Caelo	Glucose monohydrate	17005811	2
Apotheke im Forum	Glucose monohydrate	17010002-01	1
Euro OTC	Glucose monohydrate	1701002-01	10
Euro OTC	Glucose monohydrate	1707004-01	1
Euro OTC	Glucose monohydrate	1701002-02	1
Euro OTC	Glucose monohydrate	170700401	1
Caelo	Glucose monohydrate	18071402	1
Caelo	Glucose monohydrate	200415PJK01	1
Caelo	Glucose monohydrate	2316E-02209	1
Caelo	Glucose monohydrate	28051507	1
Caelo	Glucose monohydrate	5092	1
Caelo	Glucose monohydrate	613011-3p	1
Caelo	Glucose monohydrate	E056D	1
Fagron	Glucose monohydrate	E0AJ5	1

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Supplier	Substance	Batch	Spectra
Fagron	Glucose monohydrate	E144C	3
Noweda	Glucose monohydrate	10082017	1
ACM	Glucose monohydrate	KNC1164J15	1
Fagron	Glucose monohydrate	I056D	1
Fagron	Glucose monohydrate	8G31-N09	1
ACM	Glucose monohydrate	KNC1282J14	1
Eigenherstellung	Glucose monohydrate	30912HML01	1
Bombastus	Glucose monohydrate	1103027-01	1
Noweda	Glucose monohydrate	1108061-01	1
Caelo	Glucose monohydrate	1108061-01	1
Gehe	Glucose monohydrate	1108061-01	1
Eurho/Sanacorp	Glucose monohydrate	1108061-01	2
EuRho	Glucose monohydrate	1108061-02	1
Euro OTC	Glucose monohydrate	1108061-02	3
Caelo	Glucose monohydrate	11082014	1
Caelo	Glucose monohydrate	11082020	2
Eigenherstellung	Glucose monohydrate	110912HML01	1
Eigenherstellung	Glucose monohydrate	110913HJK02	1
Euro OTC	Glucose monohydrate	1114U2209	1
Caelo	Glucose monohydrate	11314516	6
Caelo	Glucose monohydrate	1131416	1
Caelo	Glucose monohydrate	11314519	2
Caelo	Glucose monohydrate	11314521	1
Caelo	Glucose monohydrate	11314525	1
Caelo	Glucose monohydrate	11314526	1
Caelo	Glucose monohydrate	11314528	11
Noweda	Glucose monohydrate	11B22-N06	1
Noweda	Glucose monohydrate	11K16-N01	1
Caelo	Glucose monohydrate	11L19-N13	3
Fagron	Glucose monohydrate	11L19-N13	1
Euro OTC	Glucose monohydrate	1204044-01	3
Noweda	Glucose monohydrate	1204044-01	3
Gehe	Glucose monohydrate	1204044-02	3
Euro OTC	Glucose monohydrate	1204044-02	10
Eigenherstellung	Glucose monohydrate	120912HML02	1
Euro OTC	Glucose monohydrate	1210034-01	10
Gehe	Glucose monohydrate	1210034-01	5
Fagron	Glucose monohydrate	1210034-01	1
Roquette Lestrem FR/ No...	Glucose monohydrate	1210034-02	1
Caelo	Glucose monohydrate	1210034-02	1
Gehe	Glucose monohydrate	1210034-02	1
Caelo	Glucose monohydrate	12284202	9
Caelo	Glucose monohydrate	12284204	2
Anzag 04.04.13	Glucose monohydrate	12284206	1
Caelo	Glucose monohydrate	12284206	8
Phoenix	Glucose monohydrate	12284206	1
Caelo	Glucose monohydrate	12284210	2
Caelo	Glucose monohydrate	12284219	13
Caelo	Glucose monohydrate	12284222	3
Caelo	Glucose monohydrate	12284230	5
Fagron	Glucose monohydrate	12B09-N05	1
Kehr	Glucose monohydrate	12C26-N06	1
Fagron	Glucose monohydrate	12G30-N01	10
Noweda	Glucose monohydrate	12G30-N01	3
Anzag	Glucose monohydrate	12G30-N01	1
Caelo	Glucose monohydrate	12G30-N01	1
Caelo	Glucose monohydrate	12G30-NO01	1
Fagron	Glucose monohydrate	12G30-NO1	2
Euro OTC	Glucose monohydrate	1305030	1
Euro OTC	Glucose monohydrate	1305030-01	7

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Supplier	Substance	Batch	Spectra
Euro OTC	Glucose monohydrate	130503001	1
Caelo	Glucose monohydrate	1305030-02	1
Gehe	Glucose monohydrate	130503002	1
Euro OTC	Glucose monohydrate	1305030-02	1
Caelo	Glucose monohydrate	13157004	1
Caelo	Glucose monohydrate	13157022	1
Fagron	Glucose monohydrate	13AN01	1
Fagron	Glucose monohydrate	13A25-N01	12
Fargron	Glucose monohydrate	13A25-N01	1
Fagron	Glucose monohydrate	13A25-n01	1
Fagron	Glucose monohydrate	13A25-No1	1
Fagron	Glucose monohydrate	13B01N03	1
Fagron	Glucose monohydrate	13A25-NO1	2
Caelo	Glucose monohydrate	13B01-N03	1
FARGON	Glucose monohydrate	13b01-n03	1
Fagron	Glucose monohydrate	13C25N09	2
Fagron	Glucose monohydrate	13C25-N09	8
Fargon	Glucose monohydrate	13C25-N09	1
Fagron	Glucose monohydrate	13C25-NO9	1
pharma gmbh	Glucose monohydrate	1401019-01	1
Euro OTC	Glucose monohydrate	140101901	1
Euro OTC	Glucose monohydrate	1406212209	1
Phönix	Glucose monohydrate	1504028-01	1
EuRho	Glucose monohydrate	151780	1
Fagron	Glucose monohydrate	151780-0004	1
Euro OTC	Glucose monohydrate	2013U-02209	1
Eigenherstellung	Glucose monohydrate	180213HJK01	1
Euro OTC	Glucose monohydrate	1601312209	1
Euro OTC	Glucose monohydrate	2023012-1	1
Fagron	Glucose monohydrate	270313PML01	1
Euro OTC	Glucose monohydrate	3413Q-02209	1
Fagron	Glucose monohydrate	3413E-02209	1
Euro OTC	Glucose monohydrate	31102013B	1
Fagron	Glucose monohydrate	4213Q-02209	1
Caelo	Glucose monohydrate	E144C	1
Euro OTC	Glucose monohydrate	E267X	1
Fagron	Glucose monohydrate	E368B	1
Fagron	Glucose monohydrate	E524W	1
Fagron	Glucose monohydrate	E571X	2
dextro energy / Noweda	Glucose monohydrate	L1299	1
Dextro/Krieger/15.05.13	Glucose monohydrate	l3092	1
Caelo	Glucose monohydrate	14334805	2
Caelo	Glucose monohydrate	15095606	1
Sanacorp,30.03.17, 7,12EUR	Glucose monohydrate	16184810	1
Caelo	Glucose monohydrate	1134506	1
Fagron	Glucose monohydrate	11K16-N01	1
Gutenberg-Apotheke	Glucose monohydrate	14B04-B01	1
Caesar & Lorenz	Glucose monohydrate	13157007	1
Fragon	Glucose monohydrate	13H06-N08	1
Caelo	Glucose monohydrate	13157021	1
Caelo	Glucose monohydrate	1401019-01	1
Phönix	Glucose monohydrate	1401019-01	1
Dextro Energy	Glucose monohydrate	L3270	1
Sanacorp	Glucose monohydrate	3/AKD100	1
Phönix	Glucose monohydrate	1210334-02	1
Caelo	Glucose monohydrate	13A25-N01	5
Dextro	Glucose monohydrate	L0222	1

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- 76 120 spectra from 463 *Apo-Ident* customers from a total of 25 302 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Glucose monohydrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Glucose monohydrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	240	0	72 193
Type B	0	395	0	161 678
Type C	0	1029	10	76 120

The substance/substance group *Glucose monohydrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.5000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 98.4810 %)
Type C	100.0000 % (> 99.8849 %)	99.0375 % (> 98.7488 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20799	21905	3.37	32.14
21274	21905	3.52	25.96
21905	21905	0.00	27.97
22308	22308	0.00	24.57
22538	22538	0.00	31.13
23006	23006	0.00	25.93

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Glucose, anhydrous**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20982-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Glucose, anhydrous; Glucosum anhydricum; Saccharum amylaceum anhydricum

Special notes

When selecting the *Glucose, anhydrous* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Glucose, anhydrous*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Glucose, anhydrous	12294514	20982	40	1402475
Caelo	Glucose, anhydrous	14033901	21363	40	20140214
Caelo	Glucose, anhydrous	14142310	21703	30	20140523
Caelo	Glucose, anhydrous	16050501	22586	40	20160317

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 150 spectra of 4 reference samples from the substance/substance group *Glucose, anhydrous*. These samples are listed above in the section *calibration samples*. The reference samples originate from 4 different batches.

- 72 283 spectra from a total of 1578 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 165 spectra from 5 reference samples of the substance/substance group *Glucose, anhydrous*.

- These include spectra of independent samples from 4 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Glucose, anhydrous	11017101	20262	30
Caelo	Glucose, anhydrous	11017110	20279	40
Caelo	Glucose, anhydrous	14142310	21703†	15
Caelo	Glucose, anhydrous	16157401	23583	40
Caelo	Glucose, anhydrous	180129	23820	40

- 161 908 spectra from a total of 3494 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 348 spectra from 76 *Apo-Ident* customers from 133 batches from the substance/substance group *Glucose, anhydrous*.

- These include spectra of independent samples from 129 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Glucose, anhydrous	3121402	1
Caelo	Glucose, anhydrous	4071505	1
Caelo	Glucose, anhydrous	5081401	1
Caelo	Glucose, anhydrous	6031505	1
Caelo	Glucose, anhydrous	10091503	1
Caelo	Glucose, anhydrous	13041501	1
Caelo	Glucose, anhydrous	13178712	1
GEHE	Glucose, anhydrous	13178715	1
Caelo	Glucose, anhydrous	13329503	3
Caelo	Glucose, anhydrous	13329512	7
Caelo	Glucose, anhydrous	14033901	2
PHOENIX 30.05.2014	Glucose, anhydrous	13329514	1
Gehe	Glucose, anhydrous	14033901	1
Caelo	Glucose, anhydrous	14033902	5
Caelo	Glucose, anhydrous	14033906	5
Caelo	Glucose, anhydrous	14033907	5
GEHE 17.07.2014	Glucose, anhydrous	14033907	1
AHD	Glucose, anhydrous	14033908	1
Caelo	Glucose, anhydrous	14033908	2
Caelo	Glucose, anhydrous	14051401	1
Caelo	Glucose, anhydrous	14142301	2
Fagron	Glucose, anhydrous	14142303	1
Caelo	Glucose, anhydrous	14142303	2
Phoenix 27.11.2014	Glucose, anhydrous	14142303	2
Caelo	Glucose, anhydrous	14142304	1
Caelo	Glucose, anhydrous	14142308	1
Gehe 27.11.14	Glucose, anhydrous	14142309	1
Caelo	Glucose, anhydrous	14142310	3
Phoenix	Glucose, anhydrous	14142310	1
Caelo	Glucose, anhydrous	14142313	2
Gehe Kassel	Glucose, anhydrous	14142313	1
Caelo	Glucose, anhydrous	14142314	3
Caelo	Glucose, anhydrous	1415U-03393	1
Caelo	Glucose, anhydrous	14319302	1
Caelo	Glucose, anhydrous	14319304	6
Caelo	Glucose, anhydrous	14319308	1
Caelo	Glucose, anhydrous	14319309	4
Gehe Kassel	Glucose, anhydrous	14319310	1
Caelo	Glucose, anhydrous	14319310	2
Caelo	Glucose, anhydrous	1439304	1
Caelo	Glucose, anhydrous	15095001	9
Caelo	Glucose, anhydrous	15095004	3
Caelo	Glucose, anhydrous	15095005	2
Caelo	Glucose, anhydrous	15148801	4
Phoenix	Glucose, anhydrous	15148801	1
Caelo	Glucose, anhydrous	15148802	7
Caelo	Glucose, anhydrous	15148803	1
Caelo	Glucose, anhydrous	15148807	6

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Supplier	Substance	Batch	Spectra
Caelo	Glucose, anhydrous	15148808	3
Caesar&Loretz	Glucose, anhydrous	15148808	1
Euro OTC	Glucose, anhydrous	15148808	1
Caelo	Glucose, anhydrous	15148809	1
Caelo	Glucose, anhydrous	15148810	4
Caelo	Glucose, anhydrous	15148813	1
Caesar & Loretz GmbH Hi...	Glucose, anhydrous	15321906	1
Caelo	Glucose, anhydrous	15329001	7
Caelo	Glucose, anhydrous	15329004	4
Rondell Apotheke	Glucose, anhydrous	15329003	1
Caelo	Glucose, anhydrous	15329005	4
Fagron	Glucose, anhydrous	15329005	2
Caelo	Glucose, anhydrous	15329006	5
Caelo	Glucose, anhydrous	15329008	2
Caesar & Loretz GmbH Hi...	Glucose, anhydrous	15329006	1
Phoenix	Glucose, anhydrous	15329010	2
Caelo	Glucose, anhydrous	15329010	2
Caelo	Glucose, anhydrous	16050501	10
Caelo	Glucose, anhydrous	16050502	4
Klenk	Glucose, anhydrous	16050502	1
Caelo	Glucose, anhydrous	16050503	7
Phoenix	Glucose, anhydrous	16050503	4
Caelo	Glucose, anhydrous	16050504	1
Allianc. Healthc. /c	Glucose, anhydrous	16050510	1
Caelo	Glucose, anhydrous	16050510	1
Bombastus	Glucose, anhydrous	160505202	1
Caelo	Glucose, anhydrous	1614U3393	1
Audor Pharma	Glucose, anhydrous	16157402	3
Caelo	Glucose, anhydrous	16157403	18
Caesar & Loretz GmbH	Glucose, anhydrous	16157403	1
Gehe	Glucose, anhydrous	16157403	2
Caelo	Glucose, anhydrous	16157406	10
Caelo	Glucose, anhydrous	16157411	3
Euro OTC	Glucose, anhydrous	16328801	3
Caelo	Glucose, anhydrous	16328801	3
Caelo	Glucose, anhydrous	16328803	1
Caelo	Glucose, anhydrous	16328805	1
Caelo	Glucose, anhydrous	1650502	1
Sonnen-Apotheke Wefensl...	Glucose, anhydrous	17/16	1
Apotheke-SiO2-Mischung	Glucose, anhydrous	18/15	1
Caelo	Glucose, anhydrous	1914I03393	1
Caelo	Glucose, anhydrous	3214M-03393	1
Caelo	Glucose, anhydrous	208223393	1
Sonnen-Apotheke Wefensl...	Glucose, anhydrous	34/16	1
Caelo	Glucose, anhydrous	106213393	1
Caelo	Glucose, anhydrous	214U-03393	1
Caelo	Glucose, anhydrous	402313393	2
Caelo	Glucose, anhydrous	712213393	1
Caelo	Glucose, anhydrous	1001313393	1
Caelo	Glucose, anhydrous	11017108	1
Caelo	Glucose, anhydrous	1114A03393	1
Caelo	Glucose, anhydrous	11017121	1
Caelo	Glucose, anhydrous	11358813	1
Caelo	Glucose, anhydrous	11358818	2
Anzag 11.08.2012	Glucose, anhydrous	11358823	1
Caelo	Glucose, anhydrous	11358823	1
Caelo	Glucose, anhydrous	11358825	1
Jenne	Glucose, anhydrous	12141705	1
Caelo	Glucose, anhydrous	12141701	1
Caelo	Glucose, anhydrous	12141706	4

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Supplier	Substance	Batch	Spectra
Caelo	Glucose, anhydrous	12141711	1
Phönix, 02.11.2012	Glucose, anhydrous	12141711	1
Caelo	Glucose, anhydrous	12141714	2
Phönix, 02.11.2012	Glucose, anhydrous	12141715	4
Caelo	Glucose, anhydrous	12141715	1
Synopharm am 10.09.2012	Glucose, anhydrous	12141717	1
Caelo	Glucose, anhydrous	12141718	3
Caelo	Glucose, anhydrous	12141717	1
Caelo	Glucose, anhydrous	12294505	3
Gehe 02.07.2013	Glucose, anhydrous	1224517	1
Caelo	Glucose, anhydrous	12294509	3
Sanacorp	Glucose, anhydrous	12294509	1
Caesar&loretz,Anzag	Glucose, anhydrous	12294509	1
Caelo	Glucose, anhydrous	12294510	3
Caelo	Glucose, anhydrous	12294514	2
Caelo	Glucose, anhydrous	12294515	2
Gehe 02.07.2013	Glucose, anhydrous	12294515	2
Phoenix	Glucose, anhydrous	12294517	1
Caelo	Glucose, anhydrous	12294519	1
Caelo	Glucose, anhydrous	12294517	2
Caelo	Glucose, anhydrous	1317815	1
Phönix	Glucose, anhydrous	13178701	1
Caelo	Glucose, anhydrous	13178702	2
Caelo	Glucose, anhydrous	13178704	4
Caelo	Glucose, anhydrous	13178707	2
Caelo	Glucose, anhydrous	13178711	3
Caelo	Glucose, anhydrous	13178715	4
Fagron	Glucose, anhydrous	13178716	1
Caelo	Glucose, anhydrous	13178716	1
Caelo	Glucose, anhydrous	13178718	1
Caelo	Glucose, anhydrous	13329501	3
Caelo	Glucose, anhydrous	13329504	2
Anzag	Glucose, anhydrous	13329505	1
Caelo	Glucose, anhydrous	13329507	2
Caelo	Glucose, anhydrous	15051301	1
Caelo	Glucose, anhydrous	1603213393	1
Caelo	Glucose, anhydrous	16101204	1
Caelo	Glucose, anhydrous	16101205	1
Caelo	Glucose, anhydrous	2102201301	1
Caelo	Glucose, anhydrous	25061204	1
Caelo	Glucose, anhydrous	2513M03393	1
Caelo	Glucose, anhydrous	26041303	1
Caelo	Glucose, anhydrous	3513I-03393	1
Caelo	Glucose, anhydrous	4713l-03393	1
Caelo	Glucose, anhydrous	4313Q3393	1
Caelo	Glucose, anhydrous	5013I3393	1
Caelo	Glucose, anhydrous	AKD14	1
Caelo	Glucose, anhydrous	Glucose1	1
Caelo	Glucose, anhydrous	Glucose2	1
Caelo	Glucose, anhydrous	15095003	2
Caelo	Glucose, anhydrous	12294509-3425311150	1
PHOENIX 30.05.2014	Glucose, anhydrous	14033902	1
Caelo	Glucose, anhydrous	15329002	1
Phoenix	Glucose, anhydrous	16050501	1
GEHE	Glucose, anhydrous	16157406	1
Caelo	Glucose, anhydrous	23091401	1
Apotheke/Defektur Misch...	Glucose, anhydrous		1
Caelo	Glucose, anhydrous	12141705	1
Caelo	Glucose, anhydrous	2013Q-03393	1

- 76 811 spectra from 463 *Apo-Ident* customers from a total of 25 415 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Glucose, anhydrous* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Glucose, anhydrous* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	150	0	72 283
Type B	0	153	12	161 908
Type C	0	321	27	76 811

The substance/substance group *Glucose, anhydrous* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.0000 %)
Type B	100.0000 % (> 99.9928 %)	92.7273 % (> 90.9091 %)
Type C	100.0000 % (> 99.8849 %)	92.2414 % (> 91.3793 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20982	20982	0.00	36.11
21363	20982	5.10	36.77
21703	20982	5.74	36.56
22586	20982	9.28	35.62

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Glutamic acid**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20436-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Glutamic acid; Acidum glutamicum; Acidum glutaminicum

Special notes

When selecting the *Glutamic acid* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Glutamic acid*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Glutamic acid	11I30-N02	20840	40	AR-15-FG-010446-02
Euro OTC	Glutamic acid	L1405023-01	21720	40	20140627
Euro OTC	Glutamic acid	1604056	22562	40	20160523*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Glutamic acid*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 140 spectra from 4 reference samples of the substance/substance group *Glutamic acid*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Pharmorgana	Glutamic acid	1000110813	20436	40
Euro OTC	Glutamic acid	L1211001-01	21282	40
Euro OTC	Glutamic acid	L1405023-01	21720†	20
Fagron	Glutamic acid	15G31-B08-311884	23599	40

- 161 933 spectra from a total of 3495 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 9 spectra from 2 *Apo-Ident* customers from 6 batches from the substance/substance group *Glutamic acid*.

- These include spectra of independent samples from 6 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Glutamic acid	13J21-N10	2
Euro OTC	Glutamic acid	28071505	1
Fagron	Glutamic acid	6120	1
Fagron	Glutamic acid	3031502	1
Fagron	Glutamic acid	13G15-N06	3
Euro OTC	Glutamic acid	WE11020045	1

- 77 150 spectra from 463 *Apo-Ident* customers from a total of 25 543 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Glutamic acid* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Glutamic acid* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	100	40	161 933
Type C	0	7	2	77 150

The substance/substance group *Glutamic acid* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	71.4286 % (> 69.2857 %)
Type C	100.0000 % (> 99.8851 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20840	20840	0.00	46.09
21720	22562	11.54	50.33
22562	22562	0.00	50.80

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Glutamine**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	23150-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Glutamine; Glutaminum; L-glutamine

Special notes

When selecting the *Glutamine* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Glutamine*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Glutamine	1702007	23150	40	20170322*
Euro OTC	Glutamine	1706010	23543	40	20170802*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 80 spectra of 2 reference samples from the substance/substance group *Glutamine*. These samples are listed above in the section *calibration samples*. The reference samples originate from 2 different batches.

- 72 353 spectra from a total of 1580 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 120 spectra from 3 reference samples of the substance/substance group *Glutamine*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Glutamine	17E05-B06-334869	23415	40
Fagron	Glutamine	17E05-B06-334869	23416	40
Euro OTC	Glutamine	1802010	23950	40

- 161 953 spectra from a total of 3497 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 0 spectra from 0 *Apo-Ident* customers from 0 batches from the substance/substance group *Glutamine*.

- These include spectra of independent samples from 0 batches, of which no spectra have been used for the generation of the database.

- 77 159 spectra from 463 *Apo-Ident* customers from a total of 25 547 batches from a further 701 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Glutamine* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Glutamine* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	72 353
Type B	0	120	0	161 953
Type C	0	0	0	77 159

The substance/substance group *Glutamine* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 95.0000 %)
Type C	100.0000 % (> 99.8849 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
23150	23150	0.00	31.16
23543	23543	0.00	30.83

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Glycine**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20823-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Glycine; Glycinum

Special notes

When selecting the *Glycine* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Glycine*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Glycine	12G13-N04	20823	40	1401163
Fagron	Glycine	13G09-N03	21276	40	20120711
Euro OTC	Glycine	1402022-01	21534	40	AR-15-FG-005430-01
Caelo	Glycine	13157303	21687	40	20130625
Caelo	Glycine	14147006	21818	40	AR-16-FG-012263-01

continued on the next page

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Glycine	15262518	23124	40	20150910
Caelo	Glycine	170265	23295	40	20170315*
Caelo	Glycine	173493	23834	40	20180117*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 320 spectra of 8 reference samples from the substance/substance group *Glycine*. These samples are listed above in the section *calibration samples*. The reference samples originate from 8 different batches.

- 72 113 spectra from a total of 1574 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 220 spectra from 7 reference samples of the substance/substance group *Glycine*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Glycine	1402022-01	21284	40
Euro OTC	Glycine	1402022-01	21534†	20
Caelo	Glycine	13157303	21687†	20
Caelo	Glycine	14147006	21818†	20
Euro OTC	Glycine	1605035	22683	40
Euro OTC	Glycine	1704015	23387	40
Euro OTC	Glycine	1801005	23912	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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- 161 853 spectra from a total of 3493 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 5 spectra from 2 *Apo-Ident* customers from 4 batches from the substance/substance group *Glycine*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Glycine	14147005	1
Caelo	Glycine	15262502	2
Caelo	Glycine	15262504	1
Caelo	Glycine	15262518	1

- 77 154 spectra from 463 *Apo-Ident* customers from a total of 25 543 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Glycine* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Glycine* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	309	11	72 113
Type B	0	219	1	161 853
Type C	0	4	1	77 154

The substance/substance group *Glycine* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9887 %)	96.5625 % (> 95.6250 %)
Type B	100.0000 % (> 99.9928 %)	99.5455 % (> 98.1818 %)
Type C	100.0000 % (> 99.8852 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20823	20823	0.00	134.03
21276	20823	14.80	134.81
21534	21534	0.00	130.88
21687	21534	9.07	138.68
21818	21818	0.00	138.39
23124	20823	24.99	133.86
23295	23295	0.00	137.10
23834	23834	0.00	140.49

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Gramicidin**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20203-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Gramicidin; Gramicidinum

Special notes

When selecting the *Gramicidin* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Gramicidin*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Gramicidin	13J15-N02	21253	40	AR-15-FG-000813-01
Fagron	Gramicidin	17E09-B02-341211	23744	40	AR-18-FG-008970-02

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 80 spectra of 2 reference samples from the substance/substance group *Gramicidin*. These samples are listed above in the section *calibration samples*. The reference samples originate from 2 different batches.

- 72 353 spectra from a total of 1580 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 120 spectra from 3 reference samples of the substance/substance group *Gramicidin*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Gramicidin	11A27-N32	20203	40
Fagron	Gramicidin	14C07-B06-292886	21544	40
Fagron	Gramicidin	15H18-B01-316269	22748	40

- 161 953 spectra from a total of 3496 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

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- 12 spectra from 5 *Apo-Ident* customers from 10 batches from the substance/substance group *Gramicidin*.

- These include spectra of independent samples from 10 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Gramicidin	11F-24-N03	1
Fagron	Gramicidin	12I07-N03	1
Fagron	Gramicidin	12K22-N12	1
Caelo	Gramicidin	13J15-NO2	1
Fagron	Gramicidin	14H06-B03-297614	3
Fagron	Gramicidin	15C11-B04-306766	1
Fagron	Gramicidin	B3200202	1
Fagron	Gramicidin	B3200266	1
Fagron	Gramicidin	12/07-N03	1
Fagron	Gramicidin	12F18-N09	1

- 77 147 spectra from 463 *Apo-Ident* customers from a total of 25 537 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Gramicidin* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Gramicidin* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	72 353
Type B	0	57	63	161 953
Type C	0	3	9	77 147

The substance/substance group *Gramicidin* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9928 %)	47.5000 % (> 45.0000 %)
Type C	100.0000 % (> 99.8851 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21253	21253	0.00	21.06
23744	23744	0.00	20.74

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Griseofulvin**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20939-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Griseofulvin; Griseofulvinum

Special notes

When selecting the *Griseofulvin* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Griseofulvin*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Griseofulvin	13D19-N03	20939	40	1401419
Fagron	Griseofulvin	14E16-B01-296834	21725	40	20140526
Fagron	Griseofulvin	16F13-B06-330832	23594	40	20160713

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Griseofulvin*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 100 spectra from 3 reference samples of the substance/substance group *Griseofulvin*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Griseofulvin	09B13-N08	20236	40
Fagron	Griseofulvin	14E16-B01-296834	21725†	20
Fagron	Griseofulvin	17L05-B05-345995	23996	40

- 161 973 spectra from a total of 3496 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 53 spectra from 25 *Apo-Ident* customers from 30 batches from the substance/substance group *Griseofulvin*.

- These include spectra of independent samples from 28 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Griseofulvin	130922	2
Fagron	Griseofulvin	13L-13B08	1
Fagron	Griseofulvin	13L13-B08	1
Fagron	Griseofulvin	13L13-B08-290316	4
Fagron	Griseofulvin	13L13-B08-290317	1
Phönix Gotha	Griseofulvin	140410	1
Fagron	Griseofulvin	140410	2
Fagron	Griseofulvin	14E16-B01	1
Fagron	Griseofulvin	14E16-B01-300366	3
Euro OTC	Griseofulvin	14E16-B01-300367	1
Fagron	Griseofulvin	14E16-B01-300367	1
Fagron	Griseofulvin	15062015A	1
Fagron	Griseofulvin	15B10-B06	1
Fagron	Griseofulvin	15B10-B06-306547	6
Fagron	Griseofulvin	15B10-B06-306663	1
Fagron	Griseofulvin	15B10-B06-396547	1
Fagron	Griseofulvin	15L03-B04-315624	3
Bombastus	Griseofulvin	15L03-HH150640	1
Fagron	Griseofulvin	16F13-B06-323067	1
Fargon GmbH & Co.KG	Griseofulvin	16F13-B06-323067	1
Fagron	Griseofulvin	16F13-B06-323068	2
Caelo	Griseofulvin	16F13-B06-323068	1
Fagron	Griseofulvin	16F13-B06-330832	2
Caelo	Griseofulvin	16F13-B06-330833	1
Fagron	Griseofulvin	HH160510	1
Noweda	Griseofulvin	16F13-B06-330833	1
Caelo	Griseofulvin	100910	1
Fagron	Griseofulvin	11J11-N13	1
Sanacorp/ F	Griseofulvin	12B06-N07	1
Fagron	Griseofulvin	10F03-N12	1
Fagron	Griseofulvin	11F30-N16	1
Fagron	Griseofulvin	12D04-N12	1
Phönix Gotha	Griseofulvin	12D04-N12	2
Fagron	Griseofulvin	12F18-N04	1
Fagron	Griseofulvin	13D19-N03	1
Fagron	Griseofulvin	13F12-N22	1

- 77 106 spectra from 463 *Apo-Ident* customers from a total of 25 517 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Griseofulvin* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose,

all relevant spectra of the various substances were compared with *Griseofulvin* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	100	0	161 973
Type C	0	46	7	77 106

The substance/substance group *Griseofulvin* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 94.0000 %)
Type C	100.0000 % (> 99.8850 %)	86.7925 % (> 81.1321 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20939	20939	0.00	53.67
21725	20939	8.67	54.44
23594	20939	3.52	54.74

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Guaifenesin**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20551-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Guaifenesin; Guaifenesinum; Guajacolum glycerinicum

Special notes

When selecting the *Guaifenesin* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Guaifenesin*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Guaifenesin	1212002-01	21287	40	20121214
Euro OTC	Guaifenesin	1506044	21864	40	20150708*
Euro OTC	Guaifenesin	1605005	22555	40	20160525*
Caelo	Guaifenesin	163333	23051	40	20161221*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 4 reference samples from the substance/substance group *Guaifenesin*. These samples are listed above in the section *calibration samples*. The reference samples originate from 4 different batches.

- 72 273 spectra from a total of 1578 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 340 spectra from 9 reference samples of the substance/substance group *Guaifenesin*.

- These include spectra of independent samples from 7 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Guaifenesin	11277411	20551	40
Caelo	Guaifenesin	11277411	20563	40
Euro OTC	Guaifenesin	1506044	21864†	20
Euro OTC	Guaifenesin	1701011	22993	40
Euro OTC	Guaifenesin	1706006	23551	40
Caelo	Guaifenesin	172496	23644	40
Euro OTC	Guaifenesin	1710033	23741	40
Euro OTC	Guaifenesin	1802001	23949	40
Euro OTC	Guaifenesin	1804004	24076	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 733 spectra from a total of 3491 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 7 spectra from 4 *Apo-Ident* customers from 6 batches from the substance/substance group *Guaifenesin*.

- These include spectra of independent samples from 5 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Phoenix 05.07.2014	Guaifenesin	1402023-01	2
Caelo	Guaifenesin	1212002-01	1
Caelo	Guaifenesin	14B20-B03-296249	1
Euro OTC	Guaifenesin	1409006-02	1
Caelo	Guaifenesin	12277311	1
Caelo	Guaifenesin	12277307	1

- 77 152 spectra from 463 *Apo-Ident* customers from a total of 25 541 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Guaifenesin* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Guaifenesin* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	72 273
Type B	0	340	0	161 733
Type C	0	6	1	77 152

The substance/substance group *Guaifenesin* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 98.2353 %)
Type C	100.0000 % (> 99.8851 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21287	22555	10.46	35.43
21864	21864	0.00	35.34
22555	22555	0.00	34.61
23051	23051	0.00	35.19

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Hard fat (601)**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20496-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Hard fat (601); Adeps solidus (601)

Special notes

When selecting the *Hard fat (601)* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Hard fat (601)*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Hard fat (601)	13296104	20997	40	1403144
Caelo	Hard fat (601)	15184905	21974	40	20150611
Caelo	Hard fat (601)	172178	23690	40	20170817*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Hard fat (601)*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 180 spectra from 5 reference samples of the substance/substance group *Hard fat (601)*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Hard fat (601)	11320006	20496	40
Caelo	Hard fat (601)	14099604	21488	40
Caelo	Hard fat (601)	15184905	21974†	20
Caelo	Hard fat (601)	162364	22648	40
Caelo	Hard fat (601)	162364	22766	40

- 161 893 spectra from a total of 3495 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 3 spectra from 1 *Apo-Ident* customers from 3 batches from the substance/substance group *Hard fat (601)*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Hard fat (601)	15184901	1
Caelo	Hard fat (601)	13296104	1
Caelo	Hard fat (601)	14099608	1

- 77 156 spectra from 463 *Apo-Ident* customers from a total of 25 544 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Hard fat (601)* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Hard fat (601)* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	135	45	161 893
Type C	0	2	1	77 156

The substance/substance group *Hard fat (601)* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	75.0000 % (> 73.3333 %)
Type C	100.0000 % (> 99.8854 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20997	20997	0.00	20.20
21974	20997	7.87	22.51
23690	23690	0.00	37.43

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Heparin sodium**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20638-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Heparin sodium; Heparinum natricum; Natrii heparini

Special notes

When selecting the *Heparin sodium* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Heparin sodium*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Heparin sodium	12H30-N07	20798	40	1404230
Euro OTC	Heparin sodium	12050009-03	21294	40	AR-15-FG-007427-02
Euro OTC	Heparin sodium	1605022-01	22804	40	9699
Fagron	Heparin sodium	12L20-B01-317990	22824	40	20130312
Yino Pharma	Heparin sodium	YN01011170904	23979	40	20180411
Yino Pharma	Heparin sodium	YN01011170502	23981	40	20180411

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 240 spectra of 6 reference samples from the substance/substance group *Heparin sodium*. These samples are listed above in the section *calibration samples*. The reference samples originate from 6 different batches.

- 72 193 spectra from a total of 1576 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 235 spectra from 6 reference samples of the substance/substance group *Heparin sodium*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Heparin sodium	1202002-01	20638	40
Fagron	Heparin sodium	16I26-B02-332108	23591	35
Yino Pharma	Heparin sodium	YN01011R1170803	23976	40
Yino Pharma	Heparin sodium	YN01011R1170803	23977	40
Yino Pharma	Heparin sodium	YN01011170904	23978	40
Yino Pharma	Heparin sodium	YN01011170502	23980	40

- 161 838 spectra from a total of 3494 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

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Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 17 spectra from 8 *Apo-Ident* customers from 12 batches from the substance/substance group *Heparin sodium*.

- These include spectra of independent samples from 11 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Heparin sodium	12G19-B02-313422	1
Fagron	Heparin sodium	12I20-B01-323107	1
Fagron	Heparin sodium	13G03-N13	3
Fagron	Heparin sodium	14D09-B08	1
Fagron	Heparin sodium	14D09-B08-293944	2
Fagron	Heparin sodium	14D09-B08-307077	1
Fiebig	Heparin sodium	16190116C0	1
Fagron	Heparin sodium	16I26-B02-327885	1
Fagron	Heparin sodium	16I26-B02-332108	1
Fagron	Heparin sodium	12H30-N07	2
Fagron	Heparin sodium	11190188SH	2
Euro OTC	Heparin sodium	1202002-01	1

- 77 142 spectra from 463 *Apo-Ident* customers from a total of 25 535 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Heparin sodium* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Heparin sodium* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	240	0	72 193
Type B	0	235	0	161 838
Type C	0	17	0	77 142

The substance/substance group *Heparin sodium* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.5000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 97.4468 %)
Type C	100.0000 % (> 99.8850 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several

new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20798	20798	0.00	55.68
21294	21294	0.00	71.38
22804	22804	0.00	61.32
22824	20798	16.29	66.74
23979	21294	17.24	72.30
23981	21294	18.07	67.81

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Histamine dihydrochloride**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20963-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Histamine dihydrochloride; Histamini dihydrochloridum; Histaminum hydrochloricum

Special notes

When selecting the *Histamine dihydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Histamine dihydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Histamine dihydr…	1111004-02	20963	40	1403674
Fagron	Histamine dihydr…	14G16-B02-299175	21668	80	20140729
Euro OTC	Histamine dihydr…	1506030	21863	40	20150706*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 3 reference samples from the substance/substance group *Histamine dihydrochloride*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 273 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 160 spectra from 5 reference samples of the substance/substance group *Histamine dihydrochloride*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
zu erfassen	Histamine dihydrochloride	`zu erfassen`	20158	40
Fagron	Histamine dihydrochloride	`14G16-B02-299175`	21668†	20
Euro OTC	Histamine dihydrochloride	`1506030`	21863†	20
Fagron	Histamine dihydrochloride	`15C25-B50-331242`	23196	40
Fagron	Histamine dihydrochloride	`15C25-B50-331242`	23197	40

- 161 913 spectra from a total of 3496 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B*

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 48 spectra from 23 *Apo-Ident* customers from 24 batches from the substance/substance group *Histamine dihydrochloride*.

- These include spectra of independent samples from 23 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Euro OTC	Histamine dihydrochloride	3031503	1
Caelo	Histamine dihydrochloride	130500601	1
Euro OTC	Histamine dihydrochloride	1411012-01	1
Euro OTC	Histamine dihydrochloride	1411012-02	2
Euro OTC	Histamine dihydrochloride	1506030-01	3
Sanacop	Histamine dihydrochloride	15C25-B01-306047	1
Fagron	Histamine dihydrochloride	15C25-B50-331242	1
Fagron	Histamine dihydrochloride	15E08-B06-313037	3
Euro OTC	Histamine dihydrochloride	1104004-01	1
Fagron	Histamine dihydrochloride	454545	1
Euro OTC	Histamine dihydrochloride	1104004-02	1
Euro OTC	Histamine dihydrochloride	111004-02	1
Euro OTC	Histamine dihydrochloride	1104004-03	1
Euro OTC	Histamine dihydrochloride	1111004-01	7
Alliance Healthcare/Now...	Histamine dihydrochloride	1111004-01	1
Euro OTC	Histamine dihydrochloride	1111004-02	3
Caelo	Histamine dihydrochloride	1111004-02	1
Fagron	Histamine dihydrochloride	11E25-N07	2
Fagron	Histamine dihydrochloride	12D02-N16	1
Fagron	Histamine dihydrochloride	12E29-N09	3
Phönix	Histamine dihydrochloride	12e29n09	1
Fagron	Histamine dihydrochloride	12K06-N08	7
Euro OTC	Histamine dihydrochloride	1305006-01	1
Euro OTC	Histamine dihydrochloride	20021412	1
Fagron	Histamine dihydrochloride	28051305	1
Fagron	Histamine dihydrochloride	25051202	1

- 77 111 spectra from 463 *Apo-Ident* customers from a total of 25 523 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Histamine dihydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Histamine dihydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	160	0	72 273
Type B	0	157	3	161 913
Type C	0	47	1	77 111

The substance/substance group *Histamine dihydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9928 %)	98.1250 % (> 96.2500 %)
Type C	100.0000 % (> 99.8850 %)	97.9167 % (> 91.6667 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20963	20963	0.00	83.64
21668	21863	5.04	82.58
21863	21863	0.00	83.61

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Histidine**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	23135-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Histidine; Histidinum; L-histidine

Special notes

When selecting the *Histidine* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Histidine*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Histidine	1703022	23135	40	20170405*
Fagron	Histidine	15I01-B12-329082	23590	40	20150921

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 80 spectra of 2 reference samples from the substance/substance group *Histidine*. These samples are listed above in the section *calibration samples*. The reference samples originate from 2 different batches.

- 72 353 spectra from a total of 1580 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 40 spectra from 1 reference samples of the substance/substance group *Histidine*.

- These include spectra of independent samples from 1 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Histidine	17F15-B04-343276	23935	40

- 162 033 spectra from a total of 3498 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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- 0 spectra from 0 *Apo-Ident* customers from 0 batches from the substance/substance group *Histidine*.

- These include spectra of independent samples from 0 batches, of which no spectra have been used for the generation of the database.

- 77 159 spectra from 463 *Apo-Ident* customers from a total of 25 547 batches from a further 701 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Histidine* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Histidine* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	72 353
Type B	0	40	0	162 033
Type C	0	0	0	77 159

The substance/substance group *Histidine* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 99.8849 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
23135	23135	0.00	96.08
23590	23135	4.95	97.71

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Hyaluronic acid sodium salt**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	21036-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Hyaluronic acid sodium salt; Natrii Hyaluronas

Special notes

When selecting the *Hyaluronic acid sodium salt* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Hyaluronic acid sodium salt*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Hyaluronic acid ...	L1302028-01	21036	40	1403532
Euro OTC	Hyaluronic acid ...	L1302028-01	21074	60	20130314
Audor	Hyaluronic acid ...	AP30101404H	22262	35	20141203
Audor	Hyaluronic acid ...	AP30101702H	23602	40	1802037

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 175 spectra of 4 reference samples from the substance/substance group *Hyaluronic acid sodium salt*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 258 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 130 spectra from 4 reference samples of the substance/substance group *Hyaluronic acid sodium salt*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Dr. Behr	Hyaluronic acid sodium salt	07071105	20518	40
Spinnrad	Hyaluronic acid sodium salt	051240342	20779	40
Audor Pharma	Hyaluronic acid sodium salt	AP30101404H	22262†	20
Caelo	Hyaluronic acid sodium salt	172347	23620	30

- 161 943 spectra from a total of 3495 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 20 spectra from 10 *Apo-Ident* customers from 14 batches from the substance/substance group *Hyaluronic acid sodium salt*.

- These include spectra of independent samples from 13 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Hyaluronic acid sodium salt	14188702	1
Calo/AHD	Hyaluronic acid sodium salt	14364704	1
Audor Pharma	Hyaluronic acid sodium salt	AP30101305H	2
Fagron	Hyaluronic acid sodium salt	L1311012-01	1
Audor Pharma	Hyaluronic acid sodium salt	AP30101404H	2
Audor Pharma	Hyaluronic acid sodium salt	AP30101505H	1
Euro OTC	Hyaluronic acid sodium salt	L1512025-01	2
Caelo	Hyaluronic acid sodium salt	1263303	1
Audor Pharma	Hyaluronic acid sodium salt	30101204H	1
Audor Pharma	Hyaluronic acid sodium salt	AP30101204H	1
Caelo	Hyaluronic acid sodium salt	14364706	2
Caelo	Hyaluronic acid sodium salt	14364707	1
Caelo	Hyaluronic acid sodium salt	15204901	1
Caelo	Hyaluronic acid sodium salt	15204903	3

- 77 139 spectra from 463 *Apo-Ident* customers from a total of 25 533 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Hyaluronic acid sodium salt* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Hyaluronic acid sodium salt* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	175	0	72 258
Type B	0	90	40	161 907
Type C	0	20	0	77 138

The substance/substance group *Hyaluronic acid sodium salt* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.5714 %)
Type B	100.0000 % (> 99.9928 %)	69.2308 % (> 66.9231 %)
Type C	100.0000 % (> 99.8850 %)	100.0000 % (> 70.0000 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21036	21036	0.00	18.02
21074	21036	2.07	20.20
22262	21036	16.96	30.93
23602	23602	0.00	22.00

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Hydrochlorothiazide**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20323-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Hydrochlorothiazide; Hydrochlorothiazidum

Special notes

When selecting the *Hydrochlorothiazide* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Hydrochlorothiazide*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Hydrochlorothiaz…	11L01-N02	20888	40	20111209
Caelo	Hydrochlorothiaz…	13008505	21589	40	AR-15-FG-014461-01

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 80 spectra of 2 reference samples from the substance/substance group *Hydrochlorothiazide*. These samples are listed above in the section *calibration samples*. The reference samples originate from 2 different batches.

- 72 353 spectra from a total of 1580 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 220 spectra from 6 reference samples of the substance/substance group *Hydrochlorothiazide*.

- These include spectra of independent samples from 4 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Hydrochlorothiazide	11E04-N10	20323	40
Fagron	Hydrochlorothiazide	11L01-N02	20378	40
Caelo	Hydrochlorothiazide	13008505	21589†	20
Caelo	Hydrochlorothiazide	14009701	23116	40
Fagron	Hydrochlorothiazide	16F17-B07-327489	23600	40
Fagron	Hydrochlorothiazide	17L20-B02-345079	23989	40

- 161 853 spectra from a total of 3493 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 107 spectra from 71 *Apo-Ident* customers from 43 batches from the substance/substance group *Hydrochlorothiazide*.

- These include spectra of independent samples from 42 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Hydrochlorothiazide	12A03-B40	3
Fagron	Hydrochlorothiazide	12A03-B40-286110	1
Fagron	Hydrochlorothiazide	12A03-B40-286111	3
Fagron	Hydrochlorothiazide	12B23-N05	1
Fagron	Hydrochlorothiazide	12L14-N11	3
Fagron	Hydrochlorothiazide	13008504	1
Caelo	Hydrochlorothiazide	13008509	6
Caelo	Hydrochlorothiazide	13008507	1
Fagron	Hydrochlorothiazide	13C25-N08	7
Caelo	Hydrochlorothiazide	14009701	16
Fagron	Hydrochlorothiazide	14B10B01	1
Caelo	Hydrochlorothiazide	14B10-B01-294558	2
Fagron	Hydrochlorothiazide	14B10-B01-294558	6
Fagron	Hydrochlorothiazide	14b10-b01-294558	1
Fagron	Hydrochlorothiazide	14B10-B01-300822	2
Fagron	Hydrochlorothiazide	14B10-B-01-300822	1
Caelo	Hydrochlorothiazide	14B10-B01-305043	1
Caesar & Loretz GmbH Hi...	Hydrochlorothiazide	152310	3
Caelo	Hydrochlorothiazide	15231002	1
Phoenix	Hydrochlorothiazide	15231003	1
Caelo	Hydrochlorothiazide	15231003	3
Caelo	Hydrochlorothiazide	15231008	1
Caelo	Hydrochlorothiazide	15231005	1
Sanacorp	Hydrochlorothiazide	15231008	1
Fagron	Hydrochlorothiazide	15E04-B03-309670	2
Fagron	Hydrochlorothiazide	15K16-B01	2
Fagron	Hydrochlorothiazide	15K16-B01-319833	6
Caelo	Hydrochlorothiazide	16269301	2
Noweda	Hydrochlorothiazide	16269307	1
Fagron	Hydrochlorothiazide	16F17-B07-324062	4
Caelo	Hydrochlorothiazide	16F17B07327489	1
Fagron	Hydrochlorothiazide	17H28-B01-340561	1
Fagron	Hydrochlorothiazide	5013Q-03660	1
Fagron	Hydrochlorothiazide	CQ1108	1
Caelo	Hydrochlorothiazide	P157/14	1
Caelo	Hydrochlorothiazide	13008504	1
Sanacorp	Hydrochlorothiazide	12A03-B40-26111	1
Fagron	Hydrochlorothiazide	CR0601	1
Fagron	Hydrochlorothiazide	11E04-N10	1
Caelo	Hydrochlorothiazide	CQ1108	1
Fagron	Hydrochlorothiazide	11L01-N02	2
Fagron	Hydrochlorothiazide	11l01-n02	2
Fagron	Hydrochlorothiazide	11G12-N12	1
Caelo	Hydrochlorothiazide	11l01n02	1
Fagron	Hydrochlorothiazide	11Lo1-No2	1
Gehe	Hydrochlorothiazide	12E04-N02	1
Fagron	Hydrochlorothiazide	12E04-N02	1
Fagron	Hydrochlorothiazide	11L01-No2	1

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Supplier	Substance	Batch	Spectra
Fagron	Hydrochlorothiazide	2002311234	1
Caelo	Hydrochlorothiazide	12L14-N11	2

- 77 052 spectra from 463 *Apo-Ident* customers from a total of 25 504 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Hydrochlorothiazide* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Hydrochlorothiazide* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	72 353
Type B	0	203	17	161 853
Type C	0	91	16	77 052

The substance/substance group *Hydrochlorothiazide* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9928 %)	92.2727 % (> 90.9091 %)
Type C	100.0000 % (> 99.8850 %)	85.0467 % (> 82.2430 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20888	21589	13.00	21.19
21589	21589	0.00	20.01

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Hydrocortisone**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20006-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Hydrocortisone; Hydrocortisonum purum

Special notes

When selecting the *Hydrocortisone* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Hydrocortisone*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Hydrocortisone	1206018-01	21293	40	20130727
Caelo	Hydrocortisone	13341502	21461	40	20131203
Euro OTC	Hydrocortisone	1509029	21899	40	20151014*
Fagron	Hydrocortisone	16A19-B06-320970	22829	40	20160204
Fagron	Hydrocortisone	16A19-B06-321981	22838	40	1702302

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Hydrocortisone	1611016	22910	40	20161220*
Fagron	Hydrocortisone	16H01-B01-326071	22928	40	20160907
Euro OTC	Hydrocortisone	1509029	21899SI	36	20151014*
Fagron	Hydrocortisone	16A19-B06-320970	22829SI	30	20160204
Fagron	Hydrocortisone	16H01-B01-326071	22928SI	40	20160907

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 386 spectra of 10 reference samples from the substance/substance group *Hydrocortisone*. These samples are listed above in the section *calibration samples*. The reference samples originate from 7 different batches.

- 72 047 spectra from a total of 1575 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 834 spectra from 24 reference samples of the substance/substance group *Hydrocortisone*.

- These include spectra of independent samples from 7 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Hydrocortisone	91050209	20006	30
Caelo	Hydrocortisone	10083801	20110	40
Caelo	Hydrocortisone	13341502	21461†	20
Caelo	Hydrocortisone	13341502	21463	60

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*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Hydrocortisone	1509029	21899†	20
Caelo	Hydrocortisone	160952	22778	40
Fagron	Hydrocortisone	16A19-B06-321981	22837	40
Caelo	Hydrocortisone	171194	23340	20
Caelo	Hydrocortisone	171194	23659	30
Caelo	Hydrocortisone	172566	23840	40
Euro OTC	Hydrocortisone	1802009	23945	40
Caelo	Hydrocortisone	180915	24020	40
Fagron	Hydrocortisone	16A19-B06-320970	not required	20
Caelo	Hydrocortisone	13341502	21463SI	60
Euro OTC	Hydrocortisone	1509029	21899SI†	15
Caelo	Hydrocortisone	160952	22778SI	40
Fagron	Hydrocortisone	16A19-B06-321981	22837SI	30
Fagron	Hydrocortisone	16A19-B06-321981	22838SI	31
Euro OTC	Hydrocortisone	1611016	22910SI	40
Caelo	Hydrocortisone	171194	23340SI	28
Caelo	Hydrocortisone	171194	23659SI	30
Caelo	Hydrocortisone	172566	23840SI	40
Euro OTC	Hydrocortisone	1802009	23945SI	40
Caelo	Hydrocortisone	180915	24020SI	40

- 161 239 spectra from a total of 3487 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 1033 spectra from 297 *Apo-Ident* customers from 245 batches from the substance/substance group *Hydrocortisone*.

- These include spectra of independent samples from 241 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Hydrocortisone	13341504	6
Euro OTC	Hydrocortisone	1112030-01	12
Caelo	Hydrocortisone	12167007	11
Caelo	Hydrocortisone	12167010	13
Caelo	Hydrocortisone	13069501	9
Caelo	Hydrocortisone	13069510	6
Großhandel	Hydrocortisone	13H08-B01-285472	1
Fagron	Hydrocortisone	14I05-B02-300228	2
Caelo	Hydrocortisone	14301312	8
Fagron	Hydrocortisone	13K22-B01-288283	1
Caelo	Hydrocortisone	15278702	7

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†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Supplier	Substance	Batch	Spectra
Caelo	Hydrocortisone	3081604	1
Euro OTC	Hydrocortisone	4091510	1
Euro OTC	Hydrocortisone	715Q-01719	1
Euro OTC	Hydrocortisone	6051502	1
Bestand	Hydrocortisone	911Q-01719	2
Nachprüfung 2312	Hydrocortisone	10282201	1
Caelo	Hydrocortisone	9271205	2
Caelo	Hydrocortisone	10282208	2
Euro OTC	Hydrocortisone	1201618-01	1
Euro OTC	Hydrocortisone	1204037-01	29
Euro OTC	Hydrocortisone	120403701	3
Euro OTC	Hydrocortisone	1206018-01	24
Caelo	Hydrocortisone	1206018-01	1
Fagron	Hydrocortisone	120601801	1
Gehe	Hydrocortisone	1206018-01	2
Fagron	Hydrocortisone	1206018-01	2
Anzag	Hydrocortisone	1206018-01	1
Fagron	Hydrocortisone	12091401	1
Caesar&Loretz GmbH	Hydrocortisone	12104308	1
Caelo	Hydrocortisone	13069505	4
GEHE 14.04.2014	Hydrocortisone	13069509	1
Caelo	Hydrocortisone	13069509	4
Alliance Health 11.01.2...	Hydrocortisone	1315505	1
Caelo	Hydrocortisone	13155601	13
AHD	Hydrocortisone	13155601	2
Caelo	Hydrocortisone	13155602	9
Caelo	Hydrocortisone	13155603	13
Caelo	Hydrocortisone	13155604	10
Caelo	Hydrocortisone	13155605	4
Noweda	Hydrocortisone	13155605	1
GEHE 03.05.2014	Hydrocortisone	13155605	1
Caelo	Hydrocortisone	13155611	2
Caelo	Hydrocortisone	13155614	4
Pharmacia&Upjohn/ Phönix	Hydrocortisone	13155614	1
Phönix Caesar u. Loretz	Hydrocortisone	13225507	1
Caelo	Hydrocortisone	133341502	1
Caelo	Hydrocortisone	13341501	9
Caelo	Hydrocortisone	13341502	11
Phönix Gotha	Hydrocortisone	13341502	1
Alliance Health25.04.2014	Hydrocortisone	13341503	3
Caelo	Hydrocortisone	13341503	1
Phönix	Hydrocortisone	13341504	2
Caelo	Hydrocortisone	13341508	4
Caelo	Hydrocortisone	13341509	9
Phönix	Hydrocortisone	13341508	1
ahd,11,95EUR 10.04.14	Hydrocortisone	13341504-07R07	1
Sanacorp	Hydrocortisone	13341509	1
Caelo	Hydrocortisone	13341510	11
Fagron	Hydrocortisone	13341510	1
Caelo	Hydrocortisone	13341511	3
Caelo	Hydrocortisone	13342504	1
Caelo	Hydrocortisone	13H08-B01-285471	1
Fagron	Hydrocortisone	13H08-B01-285469	1
Fagron	Hydrocortisone	13H08-B01-285472	4
Fagron	Hydrocortisone	13H08-B01-285473	1
Fagron	Hydrocortisone	13H08-B01-28571	1
Fagron	Hydrocortisone	13K22-B01	2
Fagron	Hydrocortisone	13K22-B011	1
Fagron	Hydrocortisone	13K22-B01-288280	1
Fagron	Hydrocortisone	13K22-B01-288282	1

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Supplier	Substance	Batch	Spectra
fargron	Hydrocortisone	13K22-B01-288284	1
Fagron	Hydrocortisone	13K22-B01-288284	3
Fagron	Hydrocortisone	14/05-B02-300227	2
Fagron	Hydrocortisone		1
Fagron	Hydrocortisone	14/05-B02-300227	1
Caelo	Hydrocortisone	140301305	1
Euro OTC	Hydrocortisone	1405001	1
EuRho	Hydrocortisone	1405001-01	3
Euro OTC	Hydrocortisone	140500101	1
Euro OTC	Hydrocortisone	1405001-01	2
Gehe	Hydrocortisone	1405001-01	2
Euro OTC	Hydrocortisone	1408023-01	5
Phönix	Hydrocortisone	1408023-01	1
Caelo	Hydrocortisone	14115103	4
Caelo	Hydrocortisone	14115104	2
Caelo	Hydrocortisone	14115105	3
Caelo	Hydrocortisone	14115107	10
Berkel AHK	Hydrocortisone	14115107	1
Caelo	Hydrocortisone	14115108	3
Caelo	Hydrocortisone	14301304	5
Caelo	Hydrocortisone	14301305	6
Berkel AHK	Hydrocortisone	14301305	1
phönix	Hydrocortisone	14301306	1
Caelo	Hydrocortisone	14301306	2
Anzag	Hydrocortisone	14301306	1
AHD;19.06.15;18,70EUR	Hydrocortisone	14301306	1
Caelo	Hydrocortisone	14301307	1
Caelo	Hydrocortisone	14301310	15
Gehe,27.0415	Hydrocortisone	14301310	1
Caelo	Hydrocortisone	14301311	9
Caelo	Hydrocortisone	14301313	5
Caelo	Hydrocortisone	1430312	1
Caelo	Hydrocortisone	1431311	1
Fagron	Hydrocortisone	14B04-B02	2
Fagron	Hydrocortisone	14B04-B02-293422	1
Caelo	Hydrocortisone	14b04-B02-293422	1
Fagron	Hydrocortisone	14B04-B02-293423	4
Fagron	Hydrocortisone	14B04-B02-293424	6
Fagron	Hydrocortisone	14I05-B02	2
Bombastus	Hydrocortisone	14I05-B02-300227	1
Fagron	Hydrocortisone	14l05-B02-300228	1
Fagron	Hydrocortisone	15/25-B01-313084	1
Fagron	Hydrocortisone	15/25-B01-318727	1
Caelo	Hydrocortisone	1501034-01	2
Euro OTC	Hydrocortisone	1501034-01	7
Anzag	Hydrocortisone	1501034-01	1
Caelo	Hydrocortisone	1501105	1
Caelo	Hydrocortisone	15021104	9
Caelo	Hydrocortisone	15021105	4
Caelo	Hydrocortisone	15021106	3
Caelo	Hydrocortisone	15021107	9
Phönix Gotha	Hydrocortisone	15021107	1
Caesar & Loretz GmbH	Hydrocortisone	15021107	1
Euro OTC	Hydrocortisone	1505010601	1
Euro OTC	Hydrocortisone	1505016-01	25
Caelo	Hydrocortisone	1505016-01	1
Euro OTC	Hydrocortisone	150501601	1
Euro OTC	Hydrocortisone	150516-01	1
Euro OTC	Hydrocortisone	1509029-01	10
Phoenix	Hydrocortisone	1509029-01	1

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Supplier	Substance	Batch	Spectra
Upjohn/Phönix	Hydrocortisone	1509029-01	1
Fagron	Hydrocortisone	1509029-01	1
Caelo	Hydrocortisone	1509029-01	2
Sanacorp	Hydrocortisone	1509029-01	1
Caelo	Hydrocortisone	150902901	1
Allianz Healthcare	Hydrocortisone	1509029-01	1
Anzag	Hydrocortisone	1509229-01	1
Euro OTC	Hydrocortisone	150929-01	1
Caelo	Hydrocortisone	1518012	1
Caelo	Hydrocortisone	1518013	1
Caelo	Hydrocortisone	15181003	10
Caesar&loretz,Phoenix	Hydrocortisone	15181004	1
Caelo	Hydrocortisone	15181004	9
Phönix Gotha	Hydrocortisone	15181004	1
Beiersdorf/ Vedono	Hydrocortisone	15181004	1
Laborchemie Apolda/Phönix	Hydrocortisone	15181004	1
Caelo	Hydrocortisone	15181006	16
Caelo	Hydrocortisone	15181007	5
Caelo	Hydrocortisone	15181008	1
Caelo	Hydrocortisone	15181012	11
sanacorp	Hydrocortisone	15181012	1
Caesar & Loretz GmbH	Hydrocortisone	15181012	1
Caelo	Hydrocortisone	15181013	8
sanacorp	Hydrocortisone	15181013	1
phönix	Hydrocortisone	15181013	1
Caelo	Hydrocortisone	15181014	4
Caelo	Hydrocortisone	15216101	7
Caelo	Hydrocortisone	15278703	9
Euro OTC	Hydrocortisone	15278703	2
Caelo	Hydrocortisone	15278705	8
Caelo	Hydrocortisone	15278706	4
Caelo	Hydrocortisone	15356902	1
Fagron	Hydrocortisone	15D14-B02	1
Fagron	Hydrocortisone	15D14-B02-311696	4
Fagron	Hydrocortisone	15I04-B03-315021	2
Fagron	Hydrocortisone	15I25-B01-318486	1
Fagron	Hydrocortisone	15I25-B01-320154	1
Fagron	Hydrocortisone	15l25-B01-318486	1
Caelo	Hydrocortisone	16004601	1
Sanacorp	Hydrocortisone	16004603	1
Caelo	Hydrocortisone	16004603	6
Caelo	Hydrocortisone	16004604	20
Bionorica	Hydrocortisone	16004604	1
Caelo	Hydrocortisone	16004605	9
Caelo	Hydrocortisone	16004607	11
Sanacorp	Hydrocortisone	16004607	1
Caelo	Hydrocortisone	16004608	2
Caelo	Hydrocortisone	16004611	4
Caelo	Hydrocortisone	16004612	7
Caelo	Hydrocortisone	16095201	11
Caelo	Hydrocortisone	16095202	2
/ AHD	Hydrocortisone	16095202	1
Caelo	Hydrocortisone	16095203	4
Caelo	Hydrocortisone	16095207	3
Caelo	Hydrocortisone	16095209	4
Caelo	Hydrocortisone	16095210	9
Caelo	Hydrocortisone	16095212	3
Caelo	Hydrocortisone	16095213	4
Caelo	Hydrocortisone	1611016-01	1
Euro OTC	Hydrocortisone	1611016-01	1

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Supplier	Substance	Batch	Spectra
Caelo	Hydrocortisone	16255606	1
Caelo	Hydrocortisone	16255603	1
Sanacorp	Hydrocortisone	16255603	1
gehe	Hydrocortisone	16255607	1
Caelo	Hydrocortisone	16255607	2
Caelo	Hydrocortisone	16272304	6
Caelo	Hydrocortisone	16255608	1
Caelo	Hydrocortisone	16272305	5
Caesar&Loretz GmbH	Hydrocortisone	16272305	1
Caesar&Loretz GmbH,Anza...	Hydrocortisone	16272305	1
Caelo	Hydrocortisone	16272306	2
Gehe	Hydrocortisone	16272306	1
Caelo	Hydrocortisone	16272311	2
Caelo	Hydrocortisone	16272308	2
Caesar&Loretz GmbH	Hydrocortisone	16272311	1
Caelo	Hydrocortisone	1672308	1
Fagron	Hydrocortisone	16A19-B06	1
Fagron	Hydrocortisone	16H01-B01	1
Fagron	Hydrocortisone	16H01-B01-324944	3
Fagron	Hydrocortisone	16j26-b04-330339	1
Caelo	Hydrocortisone	17090005	3
Caelo	Hydrocortisone	17119402	1
Caelo	Hydrocortisone	17119403	2
Caelo	Hydrocortisone	17119406	1
Caelo	Hydrocortisone	17119407	1
Caelo	Hydrocortisone	17119404	1
Caelo	Hydrocortisone	17256602	2
Fagron	Hydrocortisone	17c13-B06-333045	1
Fagron	Hydrocortisone	17E10-B04-334858	1
Caelo	Hydrocortisone	17256604	1
Fagron	Hydrocortisone	2180	1
Fagron	Hydrocortisone	17G25-B02-340864	1
Caelo	Hydrocortisone	260416v4	1
Fagron	Hydrocortisone	19051403	1
Euro OTC	Hydrocortisone	29011504	1
Sanacorp	Hydrocortisone		1
Sanacorp	Hydrocortisone	42/AKD6	1
Caelo	Hydrocortisone	42/AKD7	1
Caelo	Hydrocortisone	31032014D	1
Fagron	Hydrocortisone	K05B20130407M	1
Fagron	Hydrocortisone	K05B20131101	1
Caelo	Hydrocortisone	810911	1
Caelo	Hydrocortisone	113I-01719	1
Fagron	Hydrocortisone	5061304	1
Fagron	Hydrocortisone	5061305	1
Caelo	Hydrocortisone	7101301	1
Caelo	Hydrocortisone	9360908	1
Caelo	Hydrocortisone	10340502	2
Fagron	Hydrocortisone	11/19-N03	2
Caelo	Hydrocortisone	11021302	1
Fagron	Hydrocortisone	11021403	1
Euro OTC	Hydrocortisone	1107005-02	7
Euro OTC	Hydrocortisone	1107005-01	2
EuRho	Hydrocortisone	1107005-02	1
Euro OTC	Hydrocortisone	1107005-03	10
Anzag ek:10.01EUR 18.07.12	Hydrocortisone	1107005-03	1
Caelo	Hydrocortisone	11098413	1
Caelo	Hydrocortisone	1109845	1
Sanacorp	Hydrocortisone	1112030-01	1
AHC 02.09.13 EK9,85	Hydrocortisone	1112030-01	1

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Supplier	Substance	Batch	Spectra
Caelo	Hydrocortisone	11260302	1
Caelo	Hydrocortisone	11260303	1
Gehe	Hydrocortisone	11260305	1
Caelo	Hydrocortisone	11260304	2
Gehe	Hydrocortisone	11260303	1
Caelo	Hydrocortisone	11260305	1
Caelo	Hydrocortisone	11260307	2
Anzag	Hydrocortisone	11260305	1
Caelo	Hydrocortisone	11260308	4
Caelo	Hydrocortisone	11260309	3
Kehr	Hydrocortisone	11260309	1
Sanacorp	Hydrocortisone	11260309	2
Caelo	Hydrocortisone	11273703	1
Phoenix am 11.06.2012	Hydrocortisone	11260310	1
Fagron	Hydrocortisone	11D07-N02	1
Caelo	Hydrocortisone	11273704	2
Fagron	Hydrocortisone	11K18-N01	2
Fagron	Hydrocortisone	11k18n01	1
Fagron	Hydrocortisone	11L09-N06	1
Phönix	Hydrocortisone	11119-N03	1
Gehe	Hydrocortisone	1202032-01	1
Caelo	Hydrocortisone	11L09-N06	1
Großhandel	Hydrocortisone	11L09-N06	1
Euro OTC	Hydrocortisone	1202032-01	3
Fagron	Hydrocortisone	11L09-N09	1
Anzag 14.12.12 ek:10,01	Hydrocortisone	1202032-01	1
A.H. 10.06.13 ek: 10,01EUR	Hydrocortisone	1204037-01	1
Caelo	Hydrocortisone	120403701	1
Phönix	Hydrocortisone	1204037-01	1
Anzag/EuRho	Hydrocortisone	1204037-01	1
Euro OTC	Hydrocortisone	1204307-01	1
Caelo	Hydrocortisone	12104301	2
Caelo	Hydrocortisone	12104303	8
Noweda	Hydrocortisone	12104303	1
Caelo	Hydrocortisone	12104304	11
Großhandel	Hydrocortisone	12104304	1
Gehe	Hydrocortisone	12104304	3
Caelo	Hydrocortisone	12104305	3
Caelo	Hydrocortisone	12104306	11
Caelo	Hydrocortisone	12104307	17
Anzag 09.01.2013	Hydrocortisone	12104307	1
Caelo	Hydrocortisone	12104308	7
Phönix Gotha	Hydrocortisone	12104309	1
Caelo	Hydrocortisone	12104309	2
Caelo	Hydrocortisone	12119303	11
AHD, 02,12,13	Hydrocortisone	12104309	1
Gehe	Hydrocortisone	12119303	1
Fagron	Hydrocortisone	12119303	1
Caelo	Hydrocortisone	12119304	3
Kehr	Hydrocortisone	12167001	1
Caelo	Hydrocortisone	12167001	8
Phönix	Hydrocortisone	12167001	3
Noweda	Hydrocortisone	12167001	1
Klenk	Hydrocortisone	12167007	1
Phönix	Hydrocortisone	12167010	1
Caesar & Loretz GmbH	Hydrocortisone	12167010	1
Caelo	Hydrocortisone	1216707	1
Fagron	Hydrocortisone	12G19-N01	5
Noweda	Hydrocortisone	12G19-N01	1
Kehr	Hydrocortisone	1219304	1

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Supplier	Substance	Batch	Spectra
Fagron	Hydrocortisone	12I25-N01	3
Caelo	Hydrocortisone	12k08-n01	1
Caelo	Hydrocortisone	13063501	1
Caelo	Hydrocortisone	1306906	1
Caelo	Hydrocortisone	13069502	9
Caelo	Hydrocortisone	13069506	10
Caesar & Loretz GmbH	Hydrocortisone	13069506	1
AHD	Hydrocortisone	13069507	1
Caelo	Hydrocortisone	13069507	5
Caesar & Loretz GmbH	Hydrocortisone	13069507	1
Gehe	Hydrocortisone	13069510	1
sana corp	Hydrocortisone	13069507	1
Sanacorp	Hydrocortisone	13069509	1
Fagron	Hydrocortisone	13341504	1
Phoenix	Hydrocortisone	13341504	1
Gehe	Hydrocortisone	13H08-B01-285469	1
Gehe	Hydrocortisone	13H08-B01-285471	1
Fagron	Hydrocortisone	13H08B01285473	1
Caelo	Hydrocortisone	14B04-B02-293423	1
Caesar&loretz,Phoenix	Hydrocortisone	15021105	1
Fagron	Hydrocortisone	15125-B01-318727	1
Caelo	Hydrocortisone	1708130l	1
phönix	Hydrocortisone		2
Caelo	Hydrocortisone	2402211719	1
Caelo	Hydrocortisone	2013U-01719	1
Caelo	Hydrocortisone	2413l-01719	1
Caelo	Hydrocortisone	21101303	1
Caelo	Hydrocortisone	39/AKD17	1
Euro OTC	Hydrocortisone	4112A-01719	1
Caelo	Hydrocortisone	3912Q-01719	1
Fagron	Hydrocortisone	PH132	1
Euro OTC	Hydrocortisone	pzn4914731	1
Caelo	Hydrocortisone	9271202	1
Anzag	Hydrocortisone	1107005-02	1
Fagron	Hydrocortisone	12/25-N01	1
Fagron	Hydrocortisone	1204037-01	1
Anzag	Hydrocortisone	12104307	1
Caelo	Hydrocortisone	12167010-3437311151	1

- 76 126 spectra from 462 *Apo-Ident* customers from a total of 25 308 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Hydrocortisone* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Hydrocortisone* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	386	0	72 047
Type B	0	829	5	161 239
Type C	0	958	75	76 126

The substance/substance group *Hydrocortisone* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9887 %)	100.0000 % (> 98.4456 %)
Type B	100.0000 % (> 99.9928 %)	99.4005 % (> 99.0408 %)
Type C	100.0000 % (> 99.8849 %)	92.7396 % (> 92.4492 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21293	22910	4.89	53.71
21461	21899	2.01	52.12
21899	21899	0.00	54.31
22829	22838	6.62	57.79
22838	22838	0.00	58.37
22910	22910	0.00	53.96
22928	22910	2.09	54.40

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Hydrocortisone acetate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20010-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Hydrocortisone acetate; Hydrocortisoni acetas; Hydrocortisonum aceticum

Special notes

When selecting the *Hydrocortisone acetate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Hydrocortisone acetate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Hydrocortisone a...	1209003-01	21295	40	20121108
Euro OTC	Hydrocortisone a...	1508029	21889	40	20150902*
Fagron	Hydrocortisone a...	15A30-B09-307090	22241	40	20150226
Euro OTC	Hydrocortisone a...	1604052	22564	40	20160525*
Euro OTC	Hydrocortisone a...	1209003-01	21295SI	30	20121108
Euro OTC	Hydrocortisone a...	1508029	21889SI	29	20150902*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 219 spectra of 6 reference samples from the substance/substance group *Hydrocortisone acetate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 4 different batches.

- 72 214 spectra from a total of 1578 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 445 spectra from 15 reference samples of the substance/substance group *Hydrocortisone acetate*.

- These include spectra of independent samples from 6 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Hydrocortisone acetate	82833159	20010	30
Caelo	Hydrocortisone acetate	11263917	20602	40
Caelo	Hydrocortisone acetate	13291708	21462	60
Euro OTC	Hydrocortisone acetate	1508029	21889†	20
Fagron	Hydrocortisone acetate	15A30-B09-307090	22241†	20
Caelo	Hydrocortisone acetate	16238706	23115	40
Caelo	Hydrocortisone acetate	170862	23328	40
Euro OTC	Hydrocortisone acetate	1706021	23559	40
Euro OTC	Hydrocortisone acetate	1209003-01	21295SI†	15
Euro OTC	Hydrocortisone acetate	1508029	21889SI†	15
Fagron	Hydrocortisone acetate	15A30-B09-307090	22241SI	24
Euro OTC	Hydrocortisone acetate	1604052	22564SI	30

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*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Hydrocortisone acetate	16238706	23115SI	20
Caelo	Hydrocortisone acetate	170862	23328SI	21
Euro OTC	Hydrocortisone acetate	1706021	23559SI	30

- 161 628 spectra from a total of 3489 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 1368 spectra from 334 *Apo-Ident* customers from 258 batches from the substance/substance group *Hydrocortisone acetate*.

- These include spectra of independent samples from 253 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Hydrocortisone acetate	2061401	1
Caelo	Hydrocortisone acetate	3110516	1
Euro OTC	Hydrocortisone acetate	508029-01	2
Phönix	Hydrocortisone acetate	1112031-02	1
Euro OTC	Hydrocortisone acetate	1112031-02	5
Hedinger/Gehe	Hydrocortisone acetate	1112031-02	1
Fagron	Hydrocortisone acetate	11I01-N05	2
Caelo	Hydrocortisone acetate	12021502	1
Euro OTC	Hydrocortisone acetate	1205034-01	26
Caelo	Hydrocortisone acetate	1205034-01	5
Euro OTC	Hydrocortisone acetate	12090003-01	3
Großhandel	Hydrocortisone acetate	1209003-01	1
Euro OTC	Hydrocortisone acetate	1209003-01	21
Caelo	Hydrocortisone acetate	1209003-01	6
Anzag	Hydrocortisone acetate	1209003-01	1
Pharmacia&Upjohn Comp. ...	Hydrocortisone acetate	1209003-01	1
Euro OTC	Hydrocortisone acetate	120900301	2
Phoenix	Hydrocortisone acetate	1209003-01	2
EuRho/Phoenix	Hydrocortisone acetate	1209003-01	1
Phoenix Goettin	Hydrocortisone acetate	1209003-01	1
Phönix	Hydrocortisone acetate	12182405	1
Caelo	Hydrocortisone acetate	12182405	17
Caelo	Hydrocortisone acetate	12330102	8
Caelo	Hydrocortisone acetate	12330108	18
Fagron	Hydrocortisone acetate	12330108	2
Caelo	Hydrocortisone acetate	12330111	8
Caelo	Hydrocortisone acetate	12330112	15
Caelo	Hydrocortisone acetate	12330116	13

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[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Supplier	Substance	Batch	Spectra
Fagron	Hydrocortisone acetate	12K15-N04	7
Fagron	Hydrocortisone acetate	13/31-B07-290062	1
Fagron	Hydrocortisone acetate	13/31-B07-290061	1
Caelo	Hydrocortisone acetate	13155303	9
Caelo	Hydrocortisone acetate	1315503	1
Caesar&Loretz GmbH/Anzag	Hydrocortisone acetate	13155303	1
Caelo	Hydrocortisone acetate	13155306	7
Caelo	Hydrocortisone acetate	13155307	3
Caelo	Hydrocortisone acetate	13155308	9
Gehe	Hydrocortisone acetate	13155308	1
Caelo	Hydrocortisone acetate	13291701	2
Caelo	Hydrocortisone acetate	13291704	4
Sanacorp	Hydrocortisone acetate	13291704	1
Caelo	Hydrocortisone acetate	13291705	2
Caelo	Hydrocortisone acetate	13291706	11
Caelo	Hydrocortisone acetate	13291707	15
AHD	Hydrocortisone acetate	13291707	1
Herbasinica	Hydrocortisone acetate	13291707	1
Cealo / Noweda	Hydrocortisone acetate	13291707	1
Caelo	Hydrocortisone acetate	13291708	8
Gehe	Hydrocortisone acetate	13291708	1
Caelo	Hydrocortisone acetate	13291709	4
Caelo	Hydrocortisone acetate	13291711	8
AHDE 9.09.2014	Hydrocortisone acetate	13291711	1
Caelo	Hydrocortisone acetate	13291714	1
Caelo	Hydrocortisone acetate	1391704	1
Caelo	Hydrocortisone acetate	1391706	1
Fagron	Hydrocortisone acetate	13F25-B05-300290	2
Caelo	Hydrocortisone acetate	13G09-N08	2
Fagron	Hydrocortisone acetate	13G09-N08	4
gehe	Hydrocortisone acetate	13G09-N08	1
Noweda	Hydrocortisone acetate	13G09-N08	1
Fagron	Hydrocortisone acetate	13J31-B07	3
Fagron	Hydrocortisone acetate	13J31B07290061	1
Fagron	Hydrocortisone acetate	13J31-B07-290061	2
Fagron	Hydrocortisone acetate	13J31-B07-290062	2
Euro OTC	Hydrocortisone acetate	1404014-02	1
Euro OTC	Hydrocortisone acetate	1404017-01	14
Euro/Gehe	Hydrocortisone acetate	1404017-01	1
Euro OTC	Hydrocortisone acetate	1404017-02	5
Euro OTC	Hydrocortisone acetate	140401702	1
Apomix/Noweda	Hydrocortisone acetate	1404017-02	1
Caelo	Hydrocortisone acetate	14043901	13
Caelo	Hydrocortisone acetate	14043902	12
Phoenix 14.01.2015 EK: ...	Hydrocortisone acetate	14043902	1
Bombastus	Hydrocortisone acetate	14043902	1
	Hydrocortisone acetate	14043902	1
Caelo	Hydrocortisone acetate	14043903	14
Fagron	Hydrocortisone acetate	14043903	1
GEHE 03.07.2014	Hydrocortisone acetate	14043903	1
Caelo	Hydrocortisone acetate	14043904	14
Caelo	Hydrocortisone acetate	14043905	10
Gehe	Hydrocortisone acetate	14043905	1
Fagron	Hydrocortisone acetate	14043905	1
Fagron	Hydrocortisone acetate	14043906	1
Caelo	Hydrocortisone acetate	14043906	10
Gehe	Hydrocortisone acetate	14043906	3
Caelo	Hydrocortisone acetate	14043907	13
Gehe	Hydrocortisone acetate	14043907	1
Caelo	Hydrocortisone acetate	14043908	2

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Supplier	Substance	Batch	Spectra
Euro/ Sanacorp	Hydrocortisone acetate	1409005-01	1
Euro OTC	Hydrocortisone acetate	1409005-01	14
Sanacorp	Hydrocortisone acetate	1409005-01	3
Euro OTC	Hydrocortisone acetate	140900501	1
Phönix/Lihua	Hydrocortisone acetate	1409005-01	1
Euro OTC	Hydrocortisone acetate	1409005-02	5
Caelo	Hydrocortisone acetate	14144802	1
Caelo	Hydrocortisone acetate	14144803	11
Caelo	Hydrocortisone acetate	14144804	6
Phönix	Hydrocortisone acetate	14144804	1
Fagron	Hydrocortisone acetate	14144804	1
Caelo	Hydrocortisone acetate	14144805	16
AHD;05,02,15; 12.48EUR	Hydrocortisone acetate	14144805	1
Caelo	Hydrocortisone acetate	14144806	13
Caelo	Hydrocortisone acetate	14144807	7
Caelo	Hydrocortisone acetate	1430102	1
Caelo	Hydrocortisone acetate		2
Caelo	Hydrocortisone acetate	14301401	16
Caelo	Hydrocortisone acetate	14301402	8
caesar	Hydrocortisone acetate	14301402	1
Caelo	Hydrocortisone acetate	14301403	5
Noweda 17.07.2015	Hydrocortisone acetate	14301403	1
Caelo	Hydrocortisone acetate	14301404	5
Caelo	Hydrocortisone acetate	14301405	22
Caelo	Hydrocortisone acetate	14301406	14
Caelo	Hydrocortisone acetate	14301407	17
Caelo	Hydrocortisone acetate	14301408	10
Fagron	Hydrocortisone acetate	14A13-B04	1
Fagron	Hydrocortisone acetate	14A13-B04-294158	2
Fagron	Hydrocortisone acetate	14I16-B01-300292	2
Caelo	Hydrocortisone acetate	1501035	1
Euro OTC	Hydrocortisone acetate	1501035-01	11
Euro OTC	Hydrocortisone acetate	150103501	3
Sanacorp	Hydrocortisone acetate	1501035-01	1
Euro OTC	Hydrocortisone acetate	1502000801	1
Euro OTC	Hydrocortisone acetate	1505008	1
Euro OTC	Hydrocortisone acetate	1505008-01	40
Phoenix	Hydrocortisone acetate	1505008-01	1
Caelo	Hydrocortisone acetate	1505008-01	3
Euro OTC	Hydrocortisone acetate	150500801	3
Caesar & Loretz GmbH Hi...	Hydrocortisone acetate	1505008-01	1
Caelo	Hydrocortisone acetate	15067003	11
Caello/Anzag	Hydrocortisone acetate	15067003	1
caesar&loretz,PHönix,1....	Hydrocortisone acetate	15067003	1
Caelo	Hydrocortisone acetate	15067004	15
Caesar u Loretz	Hydrocortisone acetate	15067003	1
Caesar & Loretz GmbH	Hydrocortisone acetate	15067004	1
Caelo	Hydrocortisone acetate	15067005	14
Caelo	Hydrocortisone acetate	15067006	6
Fagron	Hydrocortisone acetate	15067006	1
Bombastus	Hydrocortisone acetate	15067006	1
Caelo	Hydrocortisone acetate	15067010	2
Caelo	Hydrocortisone acetate	15067011	8
Caelo	Hydrocortisone acetate	15067013	5
Caelo	Hydrocortisone acetate	15067017	1
Euro OTC	Hydrocortisone acetate	1508029	2
Euro OTC	Hydrocortisone acetate	1508029-01	22
Europh-Gehe	Hydrocortisone acetate	1508029-01	1
Euro/Alliance Healthcare	Hydrocortisone acetate	1508029-01	1
Euro OTC	Hydrocortisone acetate	150802901	1

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Supplier	Substance	Batch	Spectra
Caelo	Hydrocortisone acetate	15216204	2
Caelo	Hydrocortisone acetate	15356901	13
phönix	Hydrocortisone acetate	15356901	2
Caelo	Hydrocortisone acetate	15356902	21
Caelo	Hydrocortisone acetate	15356903	13
Caesar&Loretz GmbH/AHD	Hydrocortisone acetate	15356903	1
Bombastus	Hydrocortisone acetate	15356903	1
Caelo	Hydrocortisone acetate	15356904	8
Großhandel	Hydrocortisone acetate	157000	1
Phoenix	Hydrocortisone acetate	1568/05131813	1
Fagron	Hydrocortisone acetate	15A03-B09-307300	1
Fagron	Hydrocortisone acetate	15A03-B09-307133	1
Caelo	Hydrocortisone acetate	15A07-B03-306545	1
Fagro/Gehe	Hydrocortisone acetate	15A07-B03306545	1
Fagron	Hydrocortisone acetate	15A07-B03-306545	1
Phoenix	Hydrocortisone acetate	15A30-B09	1
Fagron	Hydrocortisone acetate	15A30-B09-307090	1
Fagron	Hydrocortisone acetate	15A30-B09-307133	5
Caelo	Hydrocortisone acetate	15H24B01-316480	1
Fagron	Hydrocortisone acetate	15H24-B01	1
Fagron	Hydrocortisone acetate	15H24-B01-314236	1
Caelo	Hydrocortisone acetate	15H24-B01-314236	2
Fagron	Hydrocortisone acetate	15h24-b01-314236	1
Fagron	Hydrocortisone acetate	15H24-B01-316480	1
Phoenix	Hydrocortisone acetate	15J28-B12	1
Fagron	Hydrocortisone acetate	15J28-B12	1
Fagron	Hydrocortisone acetate	15J28-B12-317771	1
Caelo	Hydrocortisone acetate	16004402	9
Caelo	Hydrocortisone acetate	160044003	1
Caelo	Hydrocortisone acetate	1600406	1
Caeol/Phoenix	Hydrocortisone acetate	16004402	1
Fagron	Hydrocortisone acetate	16004402	1
Caesar & Loretz GmbH	Hydrocortisone acetate	16004402	1
Caelo	Hydrocortisone acetate	16004403	8
Phoenix	Hydrocortisone acetate	16004403	1
Caelo	Hydrocortisone acetate	16004405	5
Caelo	Hydrocortisone acetate	16004406	15
Euro OTC	Hydrocortisone acetate	16004406	1
Caelo	Hydrocortisone acetate	16004407	13
AHD 07.03.2017 EK: 5,33	Hydrocortisone acetate	16004407	1
Caelo	Hydrocortisone acetate	16004408	8
Caesar & Loretz GmbH	Hydrocortisone acetate	16004408	1
Euro OTC	Hydrocortisone acetate	1604052-01	18
Caelo	Hydrocortisone acetate	1604052-01	3
Euro OTC	Hydrocortisone acetate	160405201	1
Fagron	Hydrocortisone acetate	160405201	1
Caesar & Loretz GmbH Hi...	Hydrocortisone acetate	16095404	1
Caelo	Hydrocortisone acetate	16095404	12
Caesar & Loretz	Hydrocortisone acetate	16095404	1
Caelo	Hydrocortisone acetate	16095405	8
Caesar & Loretz GmbH	Hydrocortisone acetate	16095405	1
Caelo	Hydrocortisone acetate	16095406	12
Caesar & Loretz GmbH	Hydrocortisone acetate	16095406	2
Caelo	Hydrocortisone acetate	16095407	4
Noweda/Apomix	Hydrocortisone acetate	16095407	1
Caelo	Hydrocortisone acetate	16095408	3
Cealo/Gehe	Hydrocortisone acetate	16095410	2
Caelo	Hydrocortisone acetate	16238704	4
Caelo	Hydrocortisone acetate	16238706	11
Sanacorp	Hydrocortisone acetate	16238706	1

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Supplier	Substance	Batch	Spectra
Caelo	Hydrocortisone acetate	16238707	4
Caelo	Hydrocortisone acetate	16238708	11
phönix	Hydrocortisone acetate	16238708	1
Caesar&Loretz GmbH,Phön...	Hydrocortisone acetate	16238708	1
Caelo	Hydrocortisone acetate	16238709	3
Sanacorp	Hydrocortisone acetate	16238710	1
Caelo	Hydrocortisone acetate	16238710	3
Gehe	Hydrocortisone acetate	16238710	1
Caelo	Hydrocortisone acetate	16238712	12
phönix	Hydrocortisone acetate	16238712	1
Caelo	Hydrocortisone acetate	16238713	1
Caelo	Hydrocortisone acetate	16238714	3
Caelo	Hydrocortisone acetate	166004407	1
Caelo	Hydrocortisone acetate	16C15-B04-321459	1
Fagron	Hydrocortisone acetate	16H18-B04-325093	1
Fagron	Hydrocortisone acetate	16H18-B04-327325	1
Fagron	Hydrocortisone acetate	16J28-B05	2
Caelo	Hydrocortisone acetate	1706021-01	1
Fagron	Hydrocortisone acetate	16J28-B05-330083	1
Caelo	Hydrocortisone acetate	170602101	1
Hedinger/Sanacorp	Hydrocortisone acetate	1706021-01	2
Caelo	Hydrocortisone acetate	17086203	3
Caelo	Hydrocortisone acetate	17086205	1
Caelo	Hydrocortisone acetate	17086204	4
Caelo	Hydrocortisone acetate	17086206	2
Fagron	Hydrocortisone acetate	17086211	1
Caelo	Hydrocortisone acetate	17086221	1
Caelo	Hydrocortisone acetate	17086207	1
Caelo	Hydrocortisone acetate	17219702	1
Caelo	Hydrocortisone acetate	17219704	2
gehe	Hydrocortisone acetate	17219707	1
Caelo	Hydrocortisone acetate	17219705	1
Caelo	Hydrocortisone acetate	17219706	1
Gatt-Koller	Hydrocortisone acetate	1734/05154415	1
Caelo	Hydrocortisone acetate	17219708	1
Caelo	Hydrocortisone acetate	27091403	1
Caelo	Hydrocortisone acetate	28071508	1
Fagron	Hydrocortisone acetate	HC0024	1
Caelo	Hydrocortisone acetate	CH13291705	1
Sanacorp	Hydrocortisone acetate		1
Gehe	Hydrocortisone acetate	HC0024	1
Fagron	Hydrocortisone acetate	M39171	1
Euro OTC	Hydrocortisone acetate	L68934	1
Lihua/phönix	Hydrocortisone acetate	KO6A20140801M	1
Caelo	Hydrocortisone acetate	P156/14	1
Fagron	Hydrocortisone acetate	NCEHAC120701	1
Fagron	Hydrocortisone acetate	NCEHAC130201	1
Caelo	Hydrocortisone acetate	7051303	1
Fagron	Hydrocortisone acetate	8563642	1
Euro OTC	Hydrocortisone acetate	911I-01718	1
Caelo	Hydrocortisone acetate	213E-01719	1
Euro OTC	Hydrocortisone acetate	1010025-01	1
Caelo	Hydrocortisone acetate	10083911	1
Fagron	Hydrocortisone acetate	11/01-N05	1
Phönix	Hydrocortisone acetate	1107004-01	1
Caelo	Hydrocortisone acetate	10301913	1
Caelo	Hydrocortisone acetate	10301904	1
Euro OTC	Hydrocortisone acetate	1107004-03	5
Euro OTC	Hydrocortisone acetate	1107004-02	2
ANZAG 16.04.2012	Hydrocortisone acetate	1107004-03	1

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Supplier	Substance	Batch	Spectra
Sanacorp	Hydrocortisone acetate	1107004-03	1
EuRho	Hydrocortisone acetate	1107004-03	1
Phönix	Hydrocortisone acetate	110700403	1
Caelo	Hydrocortisone acetate	11098604	1
Gehe	Hydrocortisone acetate	11098607	1
Euro OTC	Hydrocortisone acetate	1112031-01	14
Caelo	Hydrocortisone acetate	11098611	1
Fagron	Hydrocortisone acetate	1112031	1
Caelo	Hydrocortisone acetate	11098615	1
Caelo	Hydrocortisone acetate	11098612	1
Phönix	Hydrocortisone acetate	1112031-01	1
Phönix, 27.04.2013	Hydrocortisone acetate	1112031-01	1
Klenk	Hydrocortisone acetate	1112031-01	1
Noweda	Hydrocortisone acetate	1112031-02	1
Anzag	Hydrocortisone acetate	1112031-02	2
Anzag 01.02.2013	Hydrocortisone acetate	1112031-02	1
Großhandel	Hydrocortisone acetate	1112031-02	1
Phoenix 02.05.2013	Hydrocortisone acetate	1112031-02	1
Caelo	Hydrocortisone acetate	1112031-02	1
Caelo	Hydrocortisone acetate	1113E-01718	1
Caelo	Hydrocortisone acetate	11263902	1
Caelo	Hydrocortisone acetate	11263906	1
Anzag 17.03.2012	Hydrocortisone acetate	11263905	1
Caelo	Hydrocortisone acetate	11263905	1
Kehr	Hydrocortisone acetate	11263906	1
Caelo	Hydrocortisone acetate	11263907	1
Noweda	Hydrocortisone acetate	11263912	1
Caelo	Hydrocortisone acetate	11263911	1
Caelo	Hydrocortisone acetate	11263913	2
Sanacorp	Hydrocortisone acetate	11263913	1
Caelo	Hydrocortisone acetate	11263914	1
Caelo	Hydrocortisone acetate	11263915	2
Kehr	Hydrocortisone acetate	11263914	1
Caelo	Hydrocortisone acetate	11263916	4
Caelo	Hydrocortisone acetate	11263917	3
Noweda	Hydrocortisone acetate	11F24-N12	1
Caelo	Hydrocortisone acetate	12008402	4
Caelo	Hydrocortisone acetate	12008404	4
Caelo	Hydrocortisone acetate	12008403	2
Caelo	Hydrocortisone acetate	12008405	5
Gehe	Hydrocortisone acetate	12008405	1
Noweda/ Pharmacia & Upj...	Hydrocortisone acetate	1205034-01	1
Caelo	Hydrocortisone acetate	12008411	1
Großhandel	Hydrocortisone acetate	1205034-01	5
Phoenix	Hydrocortisone acetate	1205034-01	1
Phönix	Hydrocortisone acetate	1205034-01	1
AHD, 23.10.2013	Hydrocortisone acetate	1205034-01	1
Gehe	Hydrocortisone acetate	1205034-01	1
Euro OTC	Hydrocortisone acetate	120503401	3
Caelo	Hydrocortisone acetate	1213M-01718	1
Caelo	Hydrocortisone acetate	12182402	12
Phoenix	Hydrocortisone acetate	12182402	1
Caelo	Hydrocortisone acetate	12182403	6
Herbasinica	Hydrocortisone acetate	12182403	1
Caelo	Hydrocortisone acetate	12182404	22
Fagron	Hydrocortisone acetate	12182404	1
Sanacorp	Hydrocortisone acetate	12182404	2
Kehr	Hydrocortisone acetate	12182405	3
Caesar&loretz,Phoenix	Hydrocortisone acetate	12182405	1
Caesar & Loretz GmbH	Hydrocortisone acetate	12182405	1

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Supplier	Substance	Batch	Spectra
Phönix Gotha	Hydrocortisone acetate	12182405	1
Caelo	Hydrocortisone acetate	12182408	2
Nachprüfung	Hydrocortisone acetate		1
Caelo	Hydrocortisone acetate	12248501	1
Caelo	Hydrocortisone acetate	12183403	1
Phönix Gotha	Hydrocortisone acetate	12330103	1
Caelo	Hydrocortisone acetate	12330103	11
Caesar&loretz,Phoenix	Hydrocortisone acetate	12330103	1
Sanacorp	Hydrocortisone acetate	12330103	1
Caelo	Hydrocortisone acetate	12330104	12
Caelo	Hydrocortisone acetate	12330105	4
Caelo	Hydrocortisone acetate	12330106	6
Caelo	Hydrocortisone acetate	12330107	11
Fagron	Hydrocortisone acetate	12330107	1
Pönix 26.06.2013	Hydrocortisone acetate	12330107	1
Phoenix	Hydrocortisone acetate	12330107	1
Phönix Gotha	Hydrocortisone acetate	12330108	1
Caelo	Hydrocortisone acetate	12330110	4
Caelo	Hydrocortisone acetate	12330113	3
Caelo	Hydrocortisone acetate	12330114	1
Caelo	Hydrocortisone acetate	1233016	1
Phönix	Hydrocortisone acetate	12A13-N02	1
Gehe	Hydrocortisone acetate	1233015	1
Fagron	Hydrocortisone acetate	12A13-N02	1
FARGON	Hydrocortisone acetate	12k15-n04	1
Phönix	Hydrocortisone acetate	12K15-No4	1
Caelo	Hydrocortisone acetate	13155302	8
Sanacorp	Hydrocortisone acetate	13155302	2
Caelo	Hydrocortisone acetate	1315304	1
gehe	Hydrocortisone acetate	13155302	2
Caeolo/Noweda	Hydrocortisone acetate	13155303	1
Caelo	Hydrocortisone acetate	13155304	6
Fagron	Hydrocortisone acetate	13155311	1
Caelo	Hydrocortisone acetate	131553080	1
Fagron	Hydrocortisone acetate	13A03-N04	5
Fagron	Hydrocortisone acetate	13B25-N04	2
Fagron	Hydrocortisone acetate	13E31-No2	1
Fagron	Hydrocortisone acetate	13E31-N02	3
Caelo	Hydrocortisone acetate	1403903	1
Sanacorp	Hydrocortisone acetate	14043903	1
Caelo	Hydrocortisone acetate	1406211718	1
Euro OTC	Hydrocortisone acetate	140900502	1
Caelo	Hydrocortisone acetate	15061207	1
Caelo	Hydrocortisone acetate	17011402	1
Caelo	Hydrocortisone acetate	18011304	1
Caelo	Hydrocortisone acetate	20220911-3	1
Caelo	Hydrocortisone acetate	3110491	1
Bombastus	Hydrocortisone acetate	2712M01718	1
Caelo	Hydrocortisone acetate	2612M01718	1
Caelo	Hydrocortisone acetate	25101201	1
Caelo	Hydrocortisone acetate	27091307	1
Fagron	Hydrocortisone acetate	3613A-01718	1
Euro OTC	Hydrocortisone acetate	HCAZ11004K	2
Phönix	Hydrocortisone acetate	AKD8	1
Noweda	Hydrocortisone acetate	HCA003/0611	1
Fagron	Hydrocortisone acetate	12008411	3
AHD	Hydrocortisone acetate	1205034-01	1
Caelo	Hydrocortisone acetate	12330111-3507411061	1
Fagron	Hydrocortisone acetate	12330114	1

- 75 791 spectra from 463 *Apo-Ident* customers from a total of 25 294 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Hydrocortisone acetate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Hydrocortisone acetate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	219	0	72 214
Type B	0	445	0	161 628
Type C	0	1208	160	75 791

The substance/substance group *Hydrocortisone acetate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.2603 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 98.6517 %)
Type C	100.0000 % (> 99.8849 %)	88.3041 % (> 88.0848 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21295	21889	3.81	30.40
21889	21889	0.00	28.31
22241	21889	4.35	31.73
22564	22564	0.00	34.52

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Hydrocortisone butyrate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	21531-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Hydrocortisone butyrate; Hydrocortisoni butyras micronisatum

Special notes

When selecting the *Hydrocortisone butyrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Hydrocortisone butyrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Hydrocortisone b...	13I26-N01	21531	40	AR-15-FG-000944-01
Fagron	Hydrocortisone b...	14D23-B01-296716	21723	30	20140509
Fagron	Hydrocortisone b...	13I26-N01	21797	40	20130920
Fagron	Hydrocortisone b...	16F20-B05-323903	23182	40	20160805
Fagron	Hydrocortisone b...	13I26-N01	21797SI	30	20130920

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 180 spectra of 5 reference samples from the substance/substance group *Hydrocortisone butyrate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 253 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 433 spectra from 14 reference samples of the substance/substance group *Hydrocortisone butyrate*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Hydrocortisone butyrate	13I26-N01	21531†	20
Fagron	Hydrocortisone butyrate	14D23-B01-296716	21723†	30
Fagron	Hydrocortisone butyrate	13I26-N01	21797†	20
Fagron	Hydrocortisone butyrate	15J12-B03-322394	23721	40
Fagron	Hydrocortisone butyrate	15J12-B03-322394	23722	40
Fagron	Hydrocortisone butyrate	16J21-B01-333229	23743	40
Fagron	Hydrocortisone butyrate	16J21-B01-333229	23765	40
Fagron	Hydrocortisone butyrate	14D23-B01-296716	21723SI	48
Fagron	Hydrocortisone butyrate	13I26-N01	21797SI†	15
Fagron	Hydrocortisone butyrate	16F20-B05-323903	23182SI	20
Fagron	Hydrocortisone butyrate	15J12-B03-322394	23721SI	25
Fagron	Hydrocortisone butyrate	15J12-B03-322394	23722SI	22
Fagron	Hydrocortisone butyrate	16J21-B01-333229	23743SI	37
Fagron	Hydrocortisone butyrate	16J21-B01-333229	23765SI	36

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- 161 640 spectra from a total of 3494 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 1 spectra from 1 *Apo-Ident* customers from 1 batches from the substance/substance group *Hydrocortisone butyrate*.

- These include spectra of independent samples from 1 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Hydrocortisone butyrate	`15G08-B16-314883`	1

- 77 158 spectra from 463 *Apo-Ident* customers from a total of 25 546 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Hydrocortisone butyrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Hydrocortisone butyrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	180	0	72 253
Type B	0	433	0	161 640
Type C	0	1	0	77 158

The substance/substance group *Hydrocortisone butyrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.6667 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 98.6143 %)
Type C	100.0000 % (> 99.8862 %)	n/a (n/a)

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21531	21531	0.00	23.32
21723	21531	9.38	31.12
21797	21531	4.43	29.18
23182	21531	11.26	32.58

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Hydroquinone**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20091-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Hydroquinone; Hydrochinonum

Special notes

When selecting the *Hydroquinone* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Hydroquinone*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Hydroquinone	12288505	20884	40	20121015
Caelo	Hydroquinone	14026904	21468	40	20140122
Caelo	Hydroquinone	14281501	21791	40	AR-15-FG-008058-01
Caelo	Hydroquinone	14280110	21923	40	20141017
Caelo	Hydroquinone	15057004	21975	40	20150306
Caelo	Hydroquinone	15057001	22324	40	20150306
Caelo	Hydroquinone	15057001	22351	40	20150306

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 280 spectra of 7 reference samples from the substance/substance group *Hydroquinone*. These samples are listed above in the section *calibration samples*. The reference samples originate from 6 different batches.

- 72 153 spectra from a total of 1576 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 200 spectra from 8 reference samples of the substance/substance group *Hydroquinone*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Hydroquinone	14026904	21468†	20
Caelo	Hydroquinone	14281501	21791†	20
Caelo	Hydroquinone	14280110	21923†	20
Caelo	Hydroquinone	15057004	21975†	20
Caelo	Hydroquinone	15057001	22324†	20
Caelo	Hydroquinone	15057001	22351†	20
Caelo	Hydroquinone	16023105	23114	40
Caelo	Hydroquinone	172215	23654	40

- 161 873 spectra from a total of 3492 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 173 spectra from 112 *Apo-Ident* customers from 51 batches from the substance/substance group *Hydroquinone*.

- These include spectra of independent samples from 45 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Hydroquinone	11163905	4
Caelo	Hydroquinone	12288502	2
Alliance Healthcare	Hydroquinone	12288503	2
Caelo	Hydroquinone	13105405	8
Phönix	Hydroquinone	13105408	1
Caelo	Hydroquinone	13105408	6
Apomix/Noweda	Hydroquinone	13105408	1
Caelo	Hydroquinone	14026902	6
Caelo	Hydroquinone	14180401	2
Caelo	Hydroquinone	14180406	3
Caelo	Hydroquinone	14180410	3
Caesar & Loretz GmbH	Hydroquinone	14280104	1
Caelo	Hydroquinone	14280104	4
Caelo	Hydroquinone	14280105	2
Gehe/Gehe	Hydroquinone	14280110	1
Caelo	Hydroquinone	14281501	7
Caelo	Hydroquinone	14280110	1
Phoenix Goettin	Hydroquinone	14281501	1
Caelo	Hydroquinone	14281507	5
Caelo	Hydroquinone	15057001	11
Caelo	Hydroquinone	15057002	1
Caelo	Hydroquinone	15057004	7
Euro/Sanacorp	Hydroquinone	15057004	1
Caelo	Hydroquinone	15057010	8
Sanacorp	Hydroquinone	16023103	1
phönix	Hydroquinone	16023105	1
Caeolo	Hydroquinone	16023105	1
Caelo	Hydroquinone	16023105	3
Caelo	Hydroquinone	16023112	3
Caelo	Hydroquinone	16023113	1
Caelo	Hydroquinone	16051502	1
Caelo	Hydroquinone	18031403	1
Caelo	Hydroquinone	21102014A	1
Caelo	Hydroquinone		1
Caelo	Hydroquinone	52840166	1
ACM	Hydroquinone	KNC0635J17	1
ACM	Hydroquinone	KNC1047J15	2
Caelo	Hydroquinone	10145101	1
Fagron	Hydroquinone		1
Caelo	Hydroquinone	10145103	1
Caelo	Hydroquinone	10145113	2
Caelo	Hydroquinone	10145106	1
Caelo	Hydroquinone	11163902	1

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Supplier	Substance	Batch	Spectra
Caelo	Hydroquinone	11163907	5
Caelo	Hydroquinone	11163912	4
Caesar & Loretz GmbH, 4...	Hydroquinone	11163912	1
Caelo	Hydroquinone	11163912/Int312052	1
Caelo	Hydroquinone	1163902	1
Sanacorp	Hydroquinone	12156703	1
Caelo	Hydroquinone	12156705	5
Gehe	Hydroquinone	12156706	2
Caelo	Hydroquinone	12156706	2
Sanacorp	Hydroquinone	12288503	1
Anzag 22.02.2013	Hydroquinone	12288503	1
Caelo	Hydroquinone	12288503	2
Caelo	Hydroquinone	12288505	11
Anzag	Hydroquinone	12288505	2
A.H. 14.06.13 ek: 3,97EUR	Hydroquinone	12288505	1
Caelo	Hydroquinone	13105402	9
AHD	Hydroquinone	13105405	1
Caesar & Loretz GmbH	Hydroquinone	13105405	1
Caelo	Hydroquinone	14121202	1
Caelo	Hydroquinone	20200712-3	1
Caelo	Hydroquinone	72265417	1
14026902	Hydroquinone	InterneCharge1214Q	1
Anzag	Hydroquinone	11163912	1
Anzag	Hydroquinone	12156705	1
Caelo	Hydroquinone	1228503	1
Caelo	Hydroquinone	12285201	1
Caelo	Hydroquinone	1263912	1

- 76 986 spectra from 463 *Apo-Ident* customers from a total of 25 498 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Hydroquinone* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Hydroquinone* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	280	0	72 153
Type B	0	200	0	161 873
Type C	0	171	2	76 986

The substance/substance group *Hydroquinone* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.8571 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 97.0000 %)
Type C	100.0000 % (> 99.8850 %)	98.8439 % (> 97.1098 %)

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In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20884	21791	2.82	25.17
21468	21791	3.44	22.79
21791	21791	0.00	23.52
21923	21791	3.14	23.47
21975	21791	1.51	22.72
22324	21791	1.86	23.29
22351	21791	3.46	22.08

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Hydroxyethylcelluloses (300 / 9000 mPa · s)**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20791-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Hydroxyethylcelluloses (300 / 9000 mPa · s); Hydroxyethylcellulose (apparent viscosity 300 mPas); Hydroxyethylcellulose (apparent viscosity 9000 mPas); Hydroxyethylcellulose (nominal viscosity 300 mPas); Hydroxyethylcellulose (nominal viscosity 9000 mPas); Hydroxyethylcellulosum G 300; Hydroxyethylcellulosum H 300; Hydroxyethylcellulosum HX

Special notes

When selecting the *Hydroxyethylcelluloses (300 / 9000* mPa · s*)* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Hydroxyethylcelluloses (300 / 9000* mPa · s*)*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Hydroxyethylcell…	12249204	20791	40	20120830
Euro OTC	Hydroxyethylcell…	1110024-04	20792	40	20120110

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Hydroxyethylcell…	03936475	20862	20	20121001
Fagron	Hydroxyethylcell…	13H22-N11	20908	40	20130826
Caelo	Hydroxyethylcell…	13378506	21365	40	1507205
Caelo	Hydroxyethylcell…	14352504	21792	40	AR-15-FG-009318-01
Caelo	Hydroxyethylcell…	161006	22459	40	20160426*
Fagron	Hydroxyethylcell…	16E09-B05-327042	23102	40	20160530
Caelo	Hydroxyethylcell…	16252008	23708	40	20160907
Caelo	Hydroxyethylcell…	16278705	23710	40	20161014

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 380 spectra of 10 reference samples from the substance/substance group *Hydroxyethylcelluloses (300 / 9000* mPa · s*)*. These samples are listed above in the section *calibration samples*. The reference samples originate from 10 different batches.

- 72 053 spectra from a total of 1572 batches from further 364 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 490 spectra from 13 reference samples of the substance/substance group *Hydroxyethylcelluloses (300 / 9000* mPa · s*)*.

- These include spectra of independent samples from 10 batches, of which no spectra have been used for the generation of the database.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Supplier	Substance	Batch	Sample ID	Spectra
zu erfassen	Hydroxyethylcellulose (appar…	zu erfassen	20146	40
Caelo	Hydroxyethylcellulose (appar…	09312308	20184	50
Euro OTC	Hydroxyethylcellulose (appar…	1101022-02	20238	40
Caelo	Hydroxyethylcellulose (appar…	14352504	21792†	20
Caelo	Hydroxyethylcellulose (appar…	161006	22459†	20
Euro OTC	Hydroxyethylcellulose (appar…	1606030	22698	40
Caelo	Hydroxyethylcellulose (appar…	16012909	22809	40
Euro OTC	Hydroxyethylcellulose (appar…	1610039	22870	40
Caelo	Hydroxyethylcellulose (appar…	16252003	23584	40
Caelo	Hydroxyethylcellulose (appar…	16278705	23759	40
Caelo	Hydroxyethylcellulose (appar…	173196	23850	40
Euro OTC	Hydroxyethylcellulose (appar…	1711012	23904	40
Euro OTC	Hydroxyethylcellulose (appar…	1804003	24060	40

- 161 583 spectra from a total of 3487 batches from further 862 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 889 spectra from 279 *Apo-Ident* customers from 229 batches from the substance/substance group *Hydroxyethylcelluloses (300 / 9000* mPa · s*)*.

- These include spectra of independent samples from 223 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Euro OTC	Hydroxyethylcellulose (appar…	914E-03301	1
Euro OTC	Hydroxyethylcellulose (appar…	3081603	1
Gutenberg-Apotheke	Hydroxyethylcellulose (appar…	10019402	2
Gutenberg-Apotheke	Hydroxyethylcellulose (appar…	11048105	1
Nachprüfung 2797	Hydroxyethylcellulose (appar…	12249202	1
Euro OTC	Hydroxyethylcellulose (appar…	1110024-04	20
Euro OTC	Hydroxyethylcellulose (appar…	12175708	1
Caelo	Hydroxyethylcellulose (appar…	12156907	11
Caelo	Hydroxyethylcellulose (appar…	12274702	1
Caelo	Hydroxyethylcellulose (appar…	12369711	5
Euro OTC	Hydroxyethylcellulose (appar…	1304008-01	31
Gehe/EuRho	Hydroxyethylcellulose (appar…	1304008-01	1
Ashland / Noweda	Hydroxyethylcellulose (appar…	1304008-02	2
Euro OTC	Hydroxyethylcellulose (appar…	1304008-02	24
Euro OTC	Hydroxyethylcellulose (appar…	13072015A	1
Euro OTC	Hydroxyethylcellulose (appar…	1304008-02	1
Caelo	Hydroxyethylcellulose (appar…	13041502	1
Ashland / Phoenix	Hydroxyethylcellulose (appar…	13090020-01	1
Caelo	Hydroxyethylcellulose (appar…	1309020	1

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†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Supplier	Substance	Batch	Spectra
Caelo	Hydroxyethylcellulose (appar…	1309020-01	1
Euro OTC	Hydroxyethylcellulose (appar…	1309020-01	26
Großhandel	Hydroxyethylcellulose (appar…	1309020-01	1
Fagron	Hydroxyethylcellulose (appar…	1309020-01	2
VDL20.05.14	Hydroxyethylcellulose (appar…	1309020-01	1
Caelo	Hydroxyethylcellulose (appar…	130902001	1
Caelo	Hydroxyethylcellulose (appar…	1309020-01	1
Sanacorp/Phoenix	Hydroxyethylcellulose (appar…	1309020-01	1
Phoenix 10.07.2014	Hydroxyethylcellulose (appar…	1309020-01	1
Defektur	Hydroxyethylcellulose (appar…	1309020-01	1
Euro OTC	Hydroxyethylcellulose (appar…	1309020-02	6
Alliance Healthcare/Hed…	Hydroxyethylcellulose (appar…	1309020-02	1
Fagron	Hydroxyethylcellulose (appar…	130902002	1
Caelo	Hydroxyethylcellulose (appar…	1309020-02	1
Euro OTC	Hydroxyethylcellulose (appar…	1309020-03	10
EuRho/GEHE	Hydroxyethylcellulose (appar…	1309020-03	1
Caelo	Hydroxyethylcellulose (appar…	1315306	1
Caelo	Hydroxyethylcellulose (appar…	13153505	10
Euro OTC	Hydroxyethylcellulose (appar…	13099020-01	1
Caelo	Hydroxyethylcellulose (appar…	13153511	9
Gehe 24.06.2014	Hydroxyethylcellulose (appar…	13153505	1
Noweda	Hydroxyethylcellulose (appar…	13153511	1
Caelo	Hydroxyethylcellulose (appar…	13182702	7
Caelo	Hydroxyethylcellulose (appar…	1337808	1
Caelo	Hydroxyethylcellulose (appar…	133785	1
Caelo	Hydroxyethylcellulose (appar…	1337807	1
Caelo	Hydroxyethylcellulose (appar…	13378502	6
Caelo	Hydroxyethylcellulose (appar…	13378507	11
Noweda	Hydroxyethylcellulose (appar…	13378507	1
Caelo	Hydroxyethylcellulose (appar…	13378506	3
gehe	Hydroxyethylcellulose (appar…	13378507	2
Caesar/Noweda	Hydroxyethylcellulose (appar…	13378507	1
Caelo	Hydroxyethylcellulose (appar…	13378508	3
Caelo	Hydroxyethylcellulose (appar…	13378510	3
Caelo	Hydroxyethylcellulose (appar…	13378515	5
Caelo	Hydroxyethylcellulose (appar…	13378516	3
Caelo	Hydroxyethylcellulose (appar…	13378518	4
Caelo	Hydroxyethylcellulose (appar…	13378525	2
Fagron	Hydroxyethylcellulose (appar…	13L04-B03	2
Caelo	Hydroxyethylcellulose (appar…	13378524	1
Caelo	Hydroxyethylcellulose (appar…	13H22-N11	1
Th. Geyer	Hydroxyethylcellulose (appar…	13L04-B03	1
Fagron	Hydroxyethylcellulose (appar…	13L04-B03-289115	1
Phönix	Hydroxyethylcellulose (appar…	13L04-B03-289115	2
Ashland Ind/Gehe	Hydroxyethylcellulose (appar…	140017-01	1
Fagron	Hydroxyethylcellulose (appar…	1404-B05-300231	1
Euro OTC	Hydroxyethylcellulose (appar…	1406017	1
Fagron	Hydroxyethylcellulose (appar…	14/04-B05-300231	1
Caelo	Hydroxyethylcellulose (appar…	1406017-01	3
Euro OTC	Hydroxyethylcellulose (appar…	1406017-01	32
Euro OTC	Hydroxyethylcellulose (appar…	1406017-01	1
Gehe	Hydroxyethylcellulose (appar…	1406017-01	1
Caelo	Hydroxyethylcellulose (appar…	140601701	1
Euro OTC	Hydroxyethylcellulose (appar…	1406017-02	32
Caelo	Hydroxyethylcellulose (appar…	1406017-02	3
Euro OTC	Hydroxyethylcellulose (appar…	1406017-03	1
Caelo	Hydroxyethylcellulose (appar…	140617-02	1
Caelo	Hydroxyethylcellulose (appar…	14095901	1
Caelo	Hydroxyethylcellulose (appar…	14095905	1
Caelo	Hydroxyethylcellulose (appar…	14095911	3

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Supplier	Substance	Batch	Spectra
Caelo	Hydroxyethylcellulose (appar…	14352508	1
Caelo	Hydroxyethylcellulose (appar…	14256002	2
Caelo	Hydroxyethylcellulose (appar…	14352510	3
Caelo	Hydroxyethylcellulose (appar…	14352515	2
Euro OTC	Hydroxyethylcellulose (appar…	1496017-02	1
Fagron	Hydroxyethylcellulose (appar…	14D04-B02	2
Fagron	Hydroxyethylcellulose (appar…	14D04-B02-293555	1
Fagron	Hydroxyethylcellulose (appar…	14D04-B02-293558	2
Fagron	Hydroxyethylcellulose (appar…	14D04B02293555	1
Fagron	Hydroxyethylcellulose (appar…	14F04-B06-295130	1
Fagron	Hydroxyethylcellulose (appar…	14F04-B06-297846	1
Fagron	Hydroxyethylcellulose (appar…	14F04-B06-29784K137	1
Phoenix Goettin	Hydroxyethylcellulose (appar…	14F04-B06-295130	1
Fagron	Hydroxyethylcellulose (appar…	14I04-B05-300224	2
Fagron	Hydroxyethylcellulose (appar…	14I04-B05	2
Fagron	Hydroxyethylcellulose (appar…	14i04-b05-309049	1
Euro OTC	Hydroxyethylcellulose (appar…	1500418-02	1
Fagron	Hydroxyethylcellulose (appar…	14Io4-B05	1
Euro OTC	Hydroxyethylcellulose (appar…	1504018-01	12
Castor/Phönix	Hydroxyethylcellulose (appar…	1504018-01	1
Euro OTC	Hydroxyethylcellulose (appar…	1504018-02	22
Fagron	Hydroxyethylcellulose (appar…	1504018-02	1
Euro OTC	Hydroxyethylcellulose (appar…	1504018-03	1
Euro OTC	Hydroxyethylcellulose (appar…	1504018-03	15
Caelo	Hydroxyethylcellulose (appar…	1504018-03	1
Euro OTC	Hydroxyethylcellulose (appar…	1504019-02	1
Caelo	Hydroxyethylcellulose (appar…	1504018-1	1
Euro OTC	Hydroxyethylcellulose (appar…	150418-01	1
Caelo	Hydroxyethylcellulose (appar…	15086403	5
Fagron	Hydroxyethylcellulose (appar…	15086403	1
Caelo	Hydroxyethylcellulose (appar…	15086405	8
Caelo	Hydroxyethylcellulose (appar…	15086407	6
Fagron	Hydroxyethylcellulose (appar…	15086407	1
Caelo	Hydroxyethylcellulose (appar…	15086408	2
Caelo	Hydroxyethylcellulose (appar…	15086504	3
Caelo	Hydroxyethylcellulose (appar…	15086503	1
Caelo	Hydroxyethylcellulose (appar…	15086506	1
Caelo	Hydroxyethylcellulose (appar…	15086505	1
Caelo	Hydroxyethylcellulose (appar…	15086507	3
Caelo	Hydroxyethylcellulose (appar…	15199501	7
Jenne	Hydroxyethylcellulose (appar…	15199501	1
Euro OTC	Hydroxyethylcellulose (appar…	154018-02	1
Fagron	Hydroxyethylcellulose (appar…	15B04-B03-315495	1
Fagron	Hydroxyethylcellulose (appar…	15B04-B03-312859	3
Fagron	Hydroxyethylcellulose (appar…	15E07-B05-316511	2
phönix	Hydroxyethylcellulose (appar…	15e07b05316511	1
Fagron	Hydroxyethylcellulose (appar…	15H28-B10	2
Caelo	Hydroxyethylcellulose (appar…	16012901	1
Euro OTC	Hydroxyethylcellulose (appar…	1610039-01	10
Caelo	Hydroxyethylcellulose (appar…	16012909	1
Fagron	Hydroxyethylcellulose (appar…	15H28-B10-319028	1
Euro OTC	Hydroxyethylcellulose (appar…	1606030	1
Euro OTC	Hydroxyethylcellulose (appar…	1606030-01	25
Caelo	Hydroxyethylcellulose (appar…	1606030-01	7
Caelo	Hydroxyethylcellulose (appar…	160603001	1
Euro OTC	Hydroxyethylcellulose (appar…	1606030-02	10
apo-ident.	Hydroxyethylcellulose (appar…	1606030-02	1
Fiebig	Hydroxyethylcellulose (appar…	1606030-02	1
gepepharm/Phönix	Hydroxyethylcellulose (appar…	160603002	1
phönix	Hydroxyethylcellulose (appar…	1610039-02	1

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Supplier	Substance	Batch	Spectra
Euro OTC	Hydroxyethylcellulose (appar…	1610039-02	1
Caelo	Hydroxyethylcellulose (appar…	16100603	1
Spirig (Galderma)	Hydroxyethylcellulose (appar…	16100604	3
Caelo	Hydroxyethylcellulose (appar…	16100605	1
Caelo	Hydroxyethylcellulose (appar…	16100604	2
Caelo	Hydroxyethylcellulose (appar…	16100606	12
Phönix	Hydroxyethylcellulose (appar…	16100606	1
Ebert & Jacobi 02.08.2016	Hydroxyethylcellulose (appar…	16100606	1
Caelo	Hydroxyethylcellulose (appar…	16100607	1
Caelo	Hydroxyethylcellulose (appar…	16100610	2
Caelo	Hydroxyethylcellulose (appar…	16100612	6
Caelo	Hydroxyethylcellulose (appar…	16100613	4
Caelo	Hydroxyethylcellulose (appar…	16100611	1
Caelo	Hydroxyethylcellulose (appar…	16100615	3
Caelo	Hydroxyethylcellulose (appar…	16100617	6
Gehe	Hydroxyethylcellulose (appar…	16100617	1
Caelo	Hydroxyethylcellulose (appar…	16100622	2
Caelo	Hydroxyethylcellulose (appar…	16100625	6
Caelo	Hydroxyethylcellulose (appar…	16100626	1
Caelo	Hydroxyethylcellulose (appar…	16252003	3
Caelo	Hydroxyethylcellulose (appar…	16278702	2
Caelo	Hydroxyethylcellulose (appar…	16278705	1
Caelo	Hydroxyethylcellulose (appar…	16278715	2
Euro OTC	Hydroxyethylcellulose (appar…	16603001	1
Fagron	Hydroxyethylcellulose (appar…	16E09-B05-321320	2
Fagron	Hydroxyethylcellulose (appar…	16L07-B04-331846	2
Alliance Healthcare	Hydroxyethylcellulose (appar…	16L07-B04-331846	1
Euro OTC	Hydroxyethylcellulose (appar…	1711012-01	1
Euro OTC	Hydroxyethylcellulose (appar…	17042014A	1
Caelo	Hydroxyethylcellulose (appar…	17184503	4
Caelo	Hydroxyethylcellulose (appar…	19051406	1
Caelo	Hydroxyethylcellulose (appar…	220914PML02	1
Fagron	Hydroxyethylcellulose (appar…	2178	1
Euro OTC	Hydroxyethylcellulose (appar…	1909020-02	1
Caelo	Hydroxyethylcellulose (appar…	4815A-03301	1
Caelo	Hydroxyethylcellulose (appar…	AKD11	1
Euro OTC	Hydroxyethylcellulose (appar…	K1371	2
Euro OTC	Hydroxyethylcellulose (appar…	N1535	1
Fagron	Hydroxyethylcellulose (appar…	K1373	2
Ashland Industries/Anzag	Hydroxyethylcellulose (appar…	L1891	1
Caelo	Hydroxyethylcellulose (appar…	11186202	2
Euro OTC	Hydroxyethylcellulose (appar…	1110024-01	2
Caelo	Hydroxyethylcellulose (appar…	11266305	5
Fagron	Hydroxyethylcellulose (appar…	12C27-NO1	1
Caelo	Hydroxyethylcellulose (appar…	213I-03301	1
Euro OTC	Hydroxyethylcellulose (appar…	2402212528	1
EuRho	Hydroxyethylcellulose (appar…	3081202	1
Euro OTC	Hydroxyethylcellulose (appar…	314Q3301	1
Caelo	Hydroxyethylcellulose (appar…	8051305	1
Caelo	Hydroxyethylcellulose (appar…	10019408	2
Euro OTC	Hydroxyethylcellulose (appar…	80616-3	1
Euro OTC	Hydroxyethylcellulose (appar…	1007018-01	1
Euro OTC	Hydroxyethylcellulose (appar…	1101022-02	1
Euro OTC	Hydroxyethylcellulose (appar…	110505401	1
Euro OTC	Hydroxyethylcellulose (appar…	1108026-01	2
Noweda	Hydroxyethylcellulose (appar…	1108027-01	1
Euro OTC	Hydroxyethylcellulose (appar…	1108027-01	2
Euro OTC	Hydroxyethylcellulose (appar…	1110024-01	5
Caelo	Hydroxyethylcellulose (appar…	1110024-01	1
Euro OTC	Hydroxyethylcellulose (appar…	1110024-02	13

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Supplier	Substance	Batch	Spectra
Phönix, 21.06.2012	Hydroxyethylcellulose (appar…	1110024-02	2
Caelo	Hydroxyethylcellulose (appar…	1110024-02	2
Anzag	Hydroxyethylcellulose (appar…	1110024-03	3
Euro OTC	Hydroxyethylcellulose (appar…	1110024-03	19
Gehe	Hydroxyethylcellulose (appar…	1110024-03	1
Sanacorp	Hydroxyethylcellulose (appar…	1110024-03	1
Europharm/Otto	Hydroxyethylcellulose (appar…	1110024-03	1
Phönix	Hydroxyethylcellulose (appar…	111002403	1
EuRho	Hydroxyethylcellulose (appar…	1110024-03	1
Holdermann	Hydroxyethylcellulose (appar…	1110024-04	1
Caelo	Hydroxyethylcellulose (appar…	1110024-04	1
EuRho	Hydroxyethylcellulose (appar…	1110024-04	1
Gehe	Hydroxyethylcellulose (appar…	111002404	1
Euro OTC	Hydroxyethylcellulose (appar…	111024-02	1
Caelo	Hydroxyethylcellulose (appar…	1113E-03301	1
Euro OTC	Hydroxyethylcellulose (appar…	1110024-04-336431909	1
Euro OTC	Hydroxyethylcellulose (appar…	11110024-03	1
Caelo	Hydroxyethylcellulose (appar…	11186221	2
Caelo	Hydroxyethylcellulose (appar…	11266317	1
Caelo	Hydroxyethylcellulose (appar…	11266316	1
Caelo	Hydroxyethylcellulose (appar…	11304601	1
Caelo	Hydroxyethylcellulose (appar…	11304619	1
Caelo	Hydroxyethylcellulose (appar…	11304614	1
Caelo	Hydroxyethylcellulose (appar…	11304620	4
Fagron	Hydroxyethylcellulose (appar…	11E09-N08	1
Fagron	Hydroxyethylcellulose (appar…	11I02-N12	1
Fagron	Hydroxyethylcellulose (appar…	1212N-03301	2
Fagron	Hydroxyethylcellulose (appar…	11I02-N02	2
Erika apotheke	Hydroxyethylcellulose (appar…	12156901	1
Sanacorp	Hydroxyethylcellulose (appar…	12156901	1
Caelo	Hydroxyethylcellulose (appar…	12156901	4
Caelo	Hydroxyethylcellulose (appar…	12156902	1
Phönix	Hydroxyethylcellulose (appar…	12156902	2
Noweda	Hydroxyethylcellulose (appar…	12156907	1
Gehe	Hydroxyethylcellulose (appar…	12156908	1
Caelo	Hydroxyethylcellulose (appar…	12156908	5
Caelo	Hydroxyethylcellulose (appar…	12156915	1
Caelo	Hydroxyethylcellulose (appar…	122492014	1
Caelo	Hydroxyethylcellulose (appar…	12249202	3
Caelo	Hydroxyethylcellulose (appar…	12249204	3
Caelo	Hydroxyethylcellulose (appar…	12249205	5
Caelo	Hydroxyethylcellulose (appar…	12249216	7
Caesar & Loretz GmbH D-…	Hydroxyethylcellulose (appar…	12274702	1
Fagron	Hydroxyethylcellulose (appar…	12345	2
Caelo	Hydroxyethylcellulose (appar…	12274710	2
Caelo	Hydroxyethylcellulose (appar…	12369704	12
Phönix	Hydroxyethylcellulose (appar…	12369704	1
Phönix	Hydroxyethylcellulose (appar…	12369711	1
Caelo	Hydroxyethylcellulose (appar…	12369713	3
Caelo	Hydroxyethylcellulose (appar…	12369717	2
Caelo	Hydroxyethylcellulose (appar…	12369718	1
Gehe	Hydroxyethylcellulose (appar…	12369718	1
Fagron	Hydroxyethylcellulose (appar…	12A09-N06	3
Fagron	Hydroxyethylcellulose (appar…	12C02-N06	1
Fagron	Hydroxyethylcellulose (appar…	12C27-N01	1
Fagron	Hydroxyethylcellulose (appar…	12H02-N06	2
Sanacorp	Hydroxyethylcellulose (appar…	12H02-N06	1
Euro OTC	Hydroxyethylcellulose (appar…	13040008-02	1
Euro OTC	Hydroxyethylcellulose (appar…	130400801	1
Caelo	Hydroxyethylcellulose (appar…	1304008-01	1

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Supplier	Substance	Batch	Spectra
Euroo/Phoenix	Hydroxyethylcellulose (appar…	1304008-01	1
Ashland	Hydroxyethylcellulose (appar…	130400801	1
AHD, 28.11.13	Hydroxyethylcellulose (appar…	1304008-01	1
Eurp	Hydroxyethylcellulose (appar…	130400801	2
Euro OTC	Hydroxyethylcellulose (appar…	1304008-01	1
	Hydroxyethylcellulose (appar…	1304008-01	1
Caelo	Hydroxyethylcellulose (appar…	1304008-02	3
Alliance Health 27.12.2…	Hydroxyethylcellulose (appar…	1304008-02	1
Euro OTC	Hydroxyethylcellulose (appar…	130400802	2
Phonix	Hydroxyethylcellulose (appar…	1309020-01	1
Euro OTC	Hydroxyethylcellulose (appar…	130902001	1
Ashland/Sanacorp	Hydroxyethylcellulose (appar…	1309020-01	1
Caelo	Hydroxyethylcellulose (appar…	13153501	8
Gehe	Hydroxyethylcellulose (appar…	13153501	1
Noweda	Hydroxyethylcellulose (appar…	13153501	1
Caesar & Loretz GmbH	Hydroxyethylcellulose (appar…	13153501	1
Caelo	Hydroxyethylcellulose (appar…	13153502	1
Caelo	Hydroxyethylcellulose (appar…	13153506	9
AHD	Hydroxyethylcellulose (appar…	13153511	1
Gehe	Hydroxyethylcellulose (appar…	13A18-N01	1
Phönix	Hydroxyethylcellulose (appar…	13378507	1
Fagron	Hydroxyethylcellulose (appar…	13A18-N01	5
Fagron	Hydroxyethylcellulose (appar…	13D26-N11	6
Caelo	Hydroxyethylcellulose (appar…	13D26-N11	2
Fagron	Hydroxyethylcellulose (appar…	13H22-N11	8
Nachprüfung	Hydroxyethylcellulose (appar…	13d26-n16	2
Caelo	Hydroxyethylcellulose (appar…	140317	1
Euro OTC	Hydroxyethylcellulose (appar…	1406212528	1
Caelo	Hydroxyethylcellulose (appar…	20031305	1
Kehr	Hydroxyethylcellulose (appar…	211112PML01	1
Caelo	Hydroxyethylcellulose (appar…	26071212	1
Caelo	Hydroxyethylcellulose (appar…	26071301	1
Caelo	Hydroxyethylcellulose (appar…	290114PML01	1
Caelo	Hydroxyethylcellulose (appar…	4512I-03301	1
Caelo	Hydroxyethylcellulose (appar…	5012I-03301	1
Fagron	Hydroxyethylcellulose (appar…	J0696	2
Caelo	Hydroxyethylcellulose (appar…	AKD10	1
phönix,30.11.12	Hydroxyethylcellulose (appar…	J0696	1
s.Prüfprotokoll	Hydroxyethylcellulose (appar…		2
Euro OTC	Hydroxyethylcellulose (appar…		2
Phönix	Hydroxyethylcellulose (appar…	1304008-02	1
Bombastus	Hydroxyethylcellulose (appar…	14095911	1
Fagron	Hydroxyethylcellulose (appar…	14I04-B05-309049	1
Caelo	Hydroxyethylcellulose (appar…	1504018-02	1
Caelo	Hydroxyethylcellulose (appar…	16100620	2
Caelo	Hydroxyethylcellulose (appar…	213M-03301	1
Fagron	Hydroxyethylcellulose (appar…	16H05-B05	1
Caelo	Hydroxyethylcellulose (appar…	13182714	1
Fagron	Hydroxyethylcellulose (appar…	14F04-B06-295133	1
Caelo	Hydroxyethylcellulose (appar…	21011502	1
Caelo	Hydroxyethylcellulose (appar…	31031402	1
Gehe	Hydroxyethylcellulose (appar…	11266305	1
Kehr	Hydroxyethylcellulose (appar…	110024-02	1
Anzag	Hydroxyethylcellulose (appar…	12249204	1
Caelo	Hydroxyethylcellulose (appar…	12274720	1
Euro OTC	Hydroxyethylcellulose (appar…	1613M-03301	1
Caelo	Hydroxyethylcellulose (appar…	19011302	1
Caelo	Hydroxyethylcellulose (appar…	25071301	1
EuRho	Hydroxyethylcellulose (appar…	2512I-03301	1
Euro OTC	Hydroxyethylcellulose (appar…	130902003	1

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Supplier	Substance	Batch	Spectra
Caelo	Hydroxyethylcellulose (appar…	313Q-03301	1
Euro OTC	Hydroxyethylcellulose (appar…	1105054-01	1

- 76 270 spectra from 463 *Apo-Ident* customers from a total of 25 325 batches from a further 699 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Hydroxyethylcelluloses (300 / 9000* mPa · s*)* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Hydroxyethylcelluloses (300 / 9000* mPa · s*)* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	380	0	72 053
Type B	0	440	50	161 583
Type C	0	879	10	76 270

The substance/substance group *Hydroxyethylcelluloses (300 / 9000* mPa · s*)* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9887 %)	100.0000 % (> 98.4211 %)
Type B	100.0000 % (> 99.9928 %)	89.7959 % (> 89.1837 %)
Type C	100.0000 % (> 99.8849 %)	98.8751 % (> 98.5377 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20791	21792	13.52	78.62

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Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20792	21792	8.42	75.70
20862	22459	9.45	82.76
20908	21365	10.85	73.55
21365	21365	0.00	72.26
21792	21792	0.00	80.46
22459	22459	0.00	82.35
23102	21792	7.11	79.62
23708	21792	1.58	80.64
23710	21792	8.68	76.69

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Hydroxypropyl cellulose (300 mPa · s)**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20686-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Hydroxypropyl cellulose (300 mPa · s); Hydroxypropylcellulosum (300 mPa · s)

Special notes

When selecting the *Hydroxypropyl cellulose (300* mPa · s*)* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Hydroxypropyl cellulose (300* mPa · s*)*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Hydroxypropyl ce…	12093107	20686	40	1402049
Caelo	Hydroxypropyl ce…	14189804	21767	40	AR-15-FG-014922-01
Caelo	Hydroxypropyl ce…	15345001	22258	40	20151104

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Hydroxypropyl cellulose (300* mPa · s*)*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 120 spectra from 4 reference samples of the substance/substance group *Hydroxypropyl cellulose (300* mPa · s*)*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Hydroxypropyl cellulose (300…	14189804	21767†	20
Caelo	Hydroxypropyl cellulose (300…	15345001	22258†	20
Caelo	Hydroxypropyl cellulose (300…	15345009	23123	40
Caelo	Hydroxypropyl cellulose (300…	17355801	23974	40

- 161 953 spectra from a total of 3495 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 5 spectra from 5 *Apo-Ident* customers from 5 batches from the substance/substance group *Hydroxypropyl cellulose (300* mPa · s*)*.

- These include spectra of independent samples from 4 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Hydroxypropyl cellulose (300…	13031309	1
Caelo	Hydroxypropyl cellulose (300…	14189801	1
Caelo	Hydroxypropyl cellulose (300…	15129707	1
Caelo	Hydroxypropyl cellulose (300…	15345001	1
Caelo	Hydroxypropyl cellulose (300…	13031306	1

- 77 154 spectra from 463 *Apo-Ident* customers from a total of 25 543 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Hydroxypropyl cellulose (300* mPa · s*)* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Hydroxypropyl cellulose (300* mPa · s*)* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	115	5	161 953
Type C	0	3	2	77 154

The substance/substance group *Hydroxypropyl cellulose (300* mPa · s*)* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	95.8333 % (> 93.3333 %)
Type C	100.0000 % (> 99.8852 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20686	20686	0.00	16.92
21767	21767	0.00	18.40
22258	21767	7.18	22.89

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Hyoscine butylbromide**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20766-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Hyoscine butylbromide; Butylscopolaminium bromatum; Hyoscini butylbromidum

Special notes

When selecting the *Hyoscine butylbromide* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Hyoscine butylbromide*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Hyoscine butylbr…	12K01-N07	20766	40	1406057
Fagron	Hyoscine butylbr…	12K01-N07	20897	40	20121102
Fagron	Hyoscine butylbr…	13K22-N03	21049	40	20131126
Fagron	Hyoscine butylbr…	15I09-B04-312245	21954	40	20150921
Fagron	Hyoscine butylbr…	15I09-B04-316806	22344	40	20150921

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 200 spectra of 5 reference samples from the substance/substance group *Hyoscine butylbromide*. These samples are listed above in the section *calibration samples*. The reference samples originate from 4 different batches.

- 72 233 spectra from a total of 1578 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 132 spectra from 5 reference samples of the substance/substance group *Hyoscine butylbromide*.

- These include spectra of independent samples from 1 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Hyoscine butylbromide	15I09-B04-312245	21954†	20
Fagron	Hyoscine butylbromide	15I09-B04-316806	22344†	20
Fagron	Hyoscine butylbromide	16I20-B08-326942	22903	40
Fagron	Hyoscine butylbromide	16I20-B08-326942	22937	40
Fagron	Hyoscine butylbromide	16I20-B08-326942	not required	12

- 161 941 spectra from a total of 3496 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 0 spectra from 0 *Apo-Ident* customers from 0 batches from the substance/substance group *Hyoscine butylbromide*.

- These include spectra of independent samples from 0 batches, of which no spectra have been used for the generation of the database.

- 77 159 spectra from 463 *Apo-Ident* customers from a total of 25 547 batches from a further 701 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Hyoscine butylbromide* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Hyoscine butylbromide* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	200	0	72 233
Type B	0	132	0	161 941
Type C	0	0	0	77 159

The substance/substance group *Hyoscine butylbromide* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 95.4545 %)
Type C	100.0000 % (> 99.8849 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20766	20766	0.00	83.09
20897	20766	17.07	85.52
21049	20766	4.93	83.13
21954	20766	4.04	82.19
22344	20766	6.05	81.75

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Hyoscine hydrobromide**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	`21676-2018-07-18`
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Hyoscine hydrobromide; Scopolamini hydrobromidum

Special notes

When selecting the *Hyoscine hydrobromide* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Hyoscine hydrobromide*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Hyoscine hydrobr…	`14278801`	`21676`	40	`1504154`
Caelo	Hyoscine hydrobr…	`15054501`	`21764`	40	`1511156`
Fagron	Hyoscine hydrobr…	`15L09-B04-334706`	`23418`	40	`20151228`
Fagron	Hyoscine hydrobr…	`15L09-B04-334706`	`23419`	40	`20151228`
Caelo	Hyoscine hydrobr…	`15054501`	`21764SI`	28	`1511156`

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 188 spectra of 5 reference samples from the substance/substance group *Hyoscine hydrobromide*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 245 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 327 spectra from 9 reference samples of the substance/substance group *Hyoscine hydrobromide*.

- These include spectra of independent samples from 1 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Hyoscine hydrobromide	14278801	21676†	45
Caelo	Hyoscine hydrobromide	15054501	21764†	20
Caelo	Hyoscine hydrobromide	15054504	21925	60
Caelo	Hyoscine hydrobromide	15054504	23441	30
Caelo	Hyoscine hydrobromide	15054501	21764SI†	32
Caelo	Hyoscine hydrobromide	15054504	21925SI	30
Fagron	Hyoscine hydrobromide	15L09-B04-334706	23418SI	30
Fagron	Hyoscine hydrobromide	15L09-B04-334706	23419SI	40
Caelo	Hyoscine hydrobromide	15054504	23441SI	40

- 161 746 spectra from a total of 3495 batches from further 863 substances. These spectra were

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 2 spectra from 2 *Apo-Ident* customers from 2 batches from the substance/substance group *Hyoscine hydrobromide*.

- These include spectra of independent samples from 1 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Hyoscine hydrobromide	14278801	1
Caelo	Hyoscine hydrobromide	15054505	1

- 77 157 spectra from 463 *Apo-Ident* customers from a total of 25 545 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Hyoscine hydrobromide* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Hyoscine hydrobromide* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	188	0	72 245
Type B	0	259	68	161 746
Type C	0	1	1	77 157

The substance/substance group *Hyoscine hydrobromide* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.8085 %)
Type B	100.0000 % (> 99.9928 %)	79.2049 % (> 78.2875 %)
Type C	100.0000 % (> 99.8856 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to

exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21676	21676	0.00	20.03
21764	21764	0.00	30.39
23418	21764	8.33	29.28
23419	21764	5.37	27.37

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Ibuprofen**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20205-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Ibuprofen; Ibuprofenum

Special notes

When selecting the *Ibuprofen* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Ibuprofen*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Ibuprofen	11352219	20774	40	20120124
Euro OTC	Ibuprofen	1211011-02	21248	40	1501533
Caelo	Ibuprofen	172271	23641	40	20170831*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Ibuprofen*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 120 spectra from 3 reference samples of the substance/substance group *Ibuprofen*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Ibuprofen	09111410	20205	40
Caelo	Ibuprofen	13105108	21321	40
Euro OTC	Ibuprofen	1410025-02	23587	40

- 161 953 spectra from a total of 3496 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 19 spectra from 6 *Apo-Ident* customers from 6 batches from the substance/substance group *Ibuprofen*.

- These include spectra of independent samples from 6 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Ibuprofen	1012039-02	1
Euro OTC	Ibuprofen	1410025-01	9
Caelo	Ibuprofen		1
Euro OTC	Ibuprofen	1211011-01	1
Euro OTC	Ibuprofen	1410025-02	4
Caelo	Ibuprofen	1410025-02	2
Caelo	Ibuprofen	15103014	1

- 77 140 spectra from 463 *Apo-Ident* customers from a total of 25 541 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Ibuprofen* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ibuprofen* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	84	36	161 953
Type C	0	18	1	77 140

The substance/substance group *Ibuprofen* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	70.0000 % (> 67.5000 %)
Type C	100.0000 % (> 99.8850 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20774	23641	9.22	55.27
21248	21248	0.00	47.06
23641	23641	0.00	51.00

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Indometacin**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20720-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Indometacin; Indometacinum

Special notes

When selecting the *Indometacin* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Indometacin*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Indometacin	1012009-02	20720	40	1402050
Euro OTC	Indometacin	1205002-01	21327	40	20120521
Euro OTC	Indometacin	1512031	22291	40	20160122*
Euro OTC	Indometacin	1612017	22981	40	20170209*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 4 reference samples from the substance/substance group *Indometacin*. These samples are listed above in the section *calibration samples*. The reference samples originate from 4 different batches.

- 72 273 spectra from a total of 1578 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 100 spectra from 3 reference samples of the substance/substance group *Indometacin*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Indometacin	1512031	22291†	20
Fagron	Indometacin	17I08-B06-339738	23715	40
Euro OTC	Indometacin	1801040	23969	40

- 161 973 spectra from a total of 3496 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B*

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 5 spectra from 4 *Apo-Ident* customers from 2 batches from the substance/substance group *Indometacin*.

- These include spectra of independent samples from 1 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Euro OTC	Indometacin	1512031-01	2
Euro OTC	Indometacin	1205002-01	2
Gehe	Indometacin	1512031-01	1

- 77 154 spectra from 463 *Apo-Ident* customers from a total of 25 545 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Indometacin* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Indometacin* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	72 273
Type B	0	100	0	161 973
Type C	0	5	0	77 154

The substance/substance group *Indometacin* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 94.0000 %)
Type C	100.0000 % (> 99.8852 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to

exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20720	20720	0.00	56.00
21327	22291	3.29	59.12
22291	22291	0.00	58.28
22981	22981	0.00	53.78

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Inositol**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20420-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Inositol; Inositolum; myo-Inositolum

Special notes

When selecting the *Inositol* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Inositol*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Inositol	1206032-01	21280	40	20120814
Fagron	Inositol	13D15-B40-328250	23406	40	AR-17-FG-016393-01

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 80 spectra of 2 reference samples from the substance/substance group *Inositol*. These samples are listed above in the section *calibration samples*. The reference samples originate from 2 different batches.

- 72 353 spectra from a total of 1580 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 160 spectra from 4 reference samples of the substance/substance group *Inositol*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Inositol	1011028-01	20420	40
Euro OTC	Inositol	L1507021-01	22797	40
Fagron	Inositol	13D15-B40-328250	23405	40
Fagron	Inositol	18A03-B04-344527	23999	40

- 161 913 spectra from a total of 3495 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

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- 10 spectra from 4 *Apo-Ident* customers from 5 batches from the substance/substance group *Inositol*.

- These include spectra of independent samples from 4 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Euro OTC	Inositol	1206032-01	2
Euro OTC	Inositol	130400901	1
Euro OTC	Inositol	1304009-01	3
Euro OTC	Inositol	1407006-01	3
Fagron	Inositol	L13090200	1

- 77 149 spectra from 463 *Apo-Ident* customers from a total of 25 542 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Inositol* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Inositol* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	72 353
Type B	0	160	0	161 913
Type C	0	10	0	77 149

The substance/substance group *Inositol* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 96.2500 %)
Type C	100.0000 % (> 99.8851 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21280	23406	3.57	35.12
23406	23406	0.00	34.40

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Iodoform**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20094-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Iodoform; Iodoformium; Jodoformium

Special notes

When selecting the *Iodoform* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Iodoform*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Iodoform	12L11-B41	21278	40	20140113
Caelo	Iodoform	12283206	21297	40	20130709
Caelo	Iodoform	16012302	23192	40	AR-17-FG-012459-01

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Iodoform*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 160 spectra from 4 reference samples of the substance/substance group *Iodoform*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Iodoform	09357608	20094	40
Caelo	Iodoform	16012302	23407	40
Caelo	Iodoform	170860	23652	40
Caelo	Iodoform	180919	24012	40

- 161 913 spectra from a total of 3495 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

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- 201 spectra from 90 *Apo-Ident* customers from 80 batches from the substance/substance group *Iodoform*.

- These include spectra of independent samples from 77 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Iodoform	12070601	5
Caelo	Iodoform	12283202	5
fragon	Iodoform	12283303	1
Caelo	Iodoform	12283206	3
Fagron	Iodoform	12E30-N01	2
Fagron	Iodoform	12L11-B41	1
Caelo	Iodoform	14077601	2
Caelo	Iodoform	14077602	1
Caelo	Iodoform	14077603	3
Caelo	Iodoform	14077606	2
Caelo	Iodoform	14077702	7
Caelo	Iodoform	14230001	6
Caelo	Iodoform	14230002	4
Caelo	Iodoform	14230006	3
Caelo	Iodoform	14230007	3
Caelo	Iodoform	14230008	3
Caelo	Iodoform	14230306	6
Caelo	Iodoform	14230305	6
Caelo	Iodoform	15276103	4
Caelo	Iodoform	15276102	5
Fagron	Iodoform	14D09-B14-293029	1
Caelo	Iodoform	15276105	2
Caelo	Iodoform	15276107	1
Caelo	Iodoform	15276108	2
Caelo	Iodoform	15276111	2
Caelo	Iodoform	15276113	1
Caelo	Iodoform	1576103	1
Caelo	Iodoform	16012204	3
Caelo	Iodoform	16012302	1
Caelo	Iodoform	16012205	1
Caelo	Iodoform	16012305	1
Caelo	Iodoform	17086005	1
Caelo	Iodoform	12070102	2
Caelo	Iodoform	3041407	1
Caelo	Iodoform	10120202	1
Noweda	Iodoform	10320402	1
Anzag ek: 7,28EUR	Iodoform	12070102	1
Caelo	Iodoform	12070303	2
Noweda	Iodoform	12070407	1
Caelo	Iodoform	12070402	1
Caelo	Iodoform	12070407	1
Caesar & Loretz GmbH, 4...	Iodoform	12070501	3
Caelo	Iodoform	12070501	1
Kehr	Iodoform	12070502	1
Caelo	Iodoform	12070502	1
Phoenix	Iodoform	12070601	1
Caelo	Iodoform	12070602	3
Caelo	Iodoform	12070605	1
Caelo	Iodoform	12070606	3
Caelo	Iodoform	12070608	5
Caelo	Iodoform	12150902	6
Caelo	Iodoform	12150903	2

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Supplier	Substance	Batch	Spectra
Caelo	Iodoform	12150905	3
Phönix	Iodoform	12150903	1
Caelo	Iodoform	12150907	4
Caesar & Loretz GmbH	Iodoform	12150907	1
Phoenix	Iodoform	12150908	1
Caelo	Iodoform	12150908	5
Caelo	Iodoform	12150910	5
Caelo	Iodoform	12283201	3
Caelo	Iodoform	12283303	2
Caelo	Iodoform	12283304	2
Fagron	Iodoform	12L11-B41-290055	1
Caelo	Iodoform	12283307	1
Caelo	Iodoform	14077607	1
Caelo	Iodoform	14229506	1
Caelo	Iodoform	14229507	3
Euro OTC	Iodoform	14229504	2
Caelo	Iodoform	14229508	2
Fagron	Iodoform	14229508	1
Caelo	Iodoform	14230003	1
Caelo	Iodoform	14230302	1
Caelo	Iodoform	14230308	5
Caelo	Iodoform	15276001	3
Caelo	Iodoform	15276101	3
Caelo	Iodoform	15276002	1
Caelo	Iodoform	15276104	3
Caelo	Iodoform	15276109	1
Caelo	Iodoform	1527611	1
Caelo	Iodoform	16012201	2
Caelo	Iodoform	16012206	3
Caelo	Iodoform	16012202	1
Caelo	Iodoform	16012210	3
Caelo	Iodoform	16012207	1
Caelo	Iodoform	16012306	1
Kehr	Iodoform	2070602	1
Caelo	Iodoform	21051305	1
Caelo	Iodoform	28011503	1
Caelo	Iodoform	2013E-01726	1
Caelo	Iodoform	12283201/311152	1

- 76 958 spectra from 463 *Apo-Ident* customers from a total of 25 467 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Iodoform* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Iodoform* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

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	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	151	9	161 913
Type C	0	160	41	76 958

The substance/substance group *Iodoform* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	94.3750 % (> 92.5000 %)
Type C	100.0000 % (> 99.8850 %)	79.6020 % (> 78.1095 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21278	23192	10.77	91.49
21297	23192	11.84	93.67
23192	23192	0.00	87.26

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Ipratropium bromide**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20911-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Ipratropium bromide; Ipratropii bromidum; Ipratropium bromatum

Special notes

When selecting the *Ipratropium bromide* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Ipratropium bromide*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Ipratropium brom…	12C15-N01	20911	40	1403675
Fagron	Ipratropium brom…	12K01-N08	21272	40	20121025

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 80 spectra of 2 reference samples from the substance/substance group *Ipratropium bromide*. These samples are listed above in the section *calibration samples*. The reference samples originate from 2 different batches.

- 72 353 spectra from a total of 1580 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 120 spectra from 3 reference samples of the substance/substance group *Ipratropium bromide*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Ipratropium bromide	15C04-B02-321674	22747	40
Fagron	Ipratropium bromide	16K07-B05-335330	23597	40
Fagron	Ipratropium bromide	18B19-B05-346997	23992	40

- 161 953 spectra from a total of 3496 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

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- 1 spectra from 1 *Apo-Ident* customers from 1 batches from the substance/substance group *Ipratropium bromide*.

- These include spectra of independent samples from 1 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Ipratropium bromide	14B05-B16-294566	1

- 77 158 spectra from 463 *Apo-Ident* customers from a total of 25 546 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Ipratropium bromide* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ipratropium bromide* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	72 353
Type B	0	120	0	161 953
Type C	0	1	0	77 158

The substance/substance group *Ipratropium bromide* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 95.0000 %)
Type C	100.0000 % (> 99.8862 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20911	20911	0.00	30.85
21272	20911	9.25	36.95

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Isosorbide dinitrate 40%**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20213-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Isosorbide dinitrate 40%; Isorbidi dinitras 40%; Isosobidum dinatricum 40%

Special notes

When selecting the *Isosorbide dinitrate 40%* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Isosorbide dinitrate 40%*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Isosorbide dinit…	12F08-N04	20891	40	20120801
Fagron	Isosorbide dinit…	13D15-N02	21347	39	20130410
Fagron	Isosorbide dinit…	15I10-B01-328577	23200	40	1709092
Fagron	Isosorbide dinit…	17C29-B01-339447	24057	40	20170517

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 159 spectra of 4 reference samples from the substance/substance group *Isosorbide dinitrate 40%*. These samples are listed above in the section *calibration samples*. The reference samples originate from 4 different batches.

- 72 274 spectra from a total of 1578 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 110 spectra from 3 reference samples of the substance/substance group *Isosorbide dinitrate 40%*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Isosorbide dinitrate 40%	10L09-N10	20213	40
Fagron	Isosorbide dinitrate 40%	15I10-B01-315217	22762	40
Fagron	Isosorbide dinitrate 40%	15I10-B01-328577	23598	30

- 161 963 spectra from a total of 3496 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details

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provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 227 spectra from 116 *Apo-Ident* customers from 87 batches from the substance/substance group *Isosorbide dinitrate 40%*.

- These include spectra of independent samples from 81 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Isosorbide dinitrate 40%	14D09-B03	8
Caelo	Isosorbide dinitrate 40%	14D09-B03-294281	2
Fagron	Isosorbide dinitrate 40%	14D09-B03-300234	13
Fagron	Isosorbide dinitrate 40%	14D09-B03-307018	1
Fagron	Isosorbide dinitrate 40%	14D09-B03-308419	12
Fagron	Isosorbide dinitrate 40%		2
Caelo	Isosorbide dinitrate 40%	11D12-N01	1
Fagron	Isosorbide dinitrate 40%	12C08-N05	6
Gehe	Isosorbide dinitrate 40%	11D12-N01	1
Fagron	Isosorbide dinitrate 40%	13D15-N02	10
Fagron	Isosorbide dinitrate 40%	13F27-N04	9
Fagron	Isosorbide dinitrate 40%	12f08-n04	1
Fagron	Isosorbide dinitrate 40%	14D09-B03-294282	4
Fagron	Isosorbide dinitrate 40%	14D09-B03-294280	8
VDl 28.10.14 10,32 euro	Isosorbide dinitrate 40%		1
Fagron	Isosorbide dinitrate 40%	14D09-B03-29481	1
Fagron	Isosorbide dinitrate 40%	12F08-N04	11
Fagron	Isosorbide dinitrate 40%	10C19-N01	1
Fagron	Isosorbide dinitrate 40%	101652	1
Fagron	Isosorbide dinitrate 40%	8564340	1
Caelo	Isosorbide dinitrate 40%	11/17-N05	1
Fagron	Isosorbide dinitrate 40%	11D12-N01	4
Fagron	Isosorbide dinitrate 40%	12k14-n02	1
Fagron	Isosorbide dinitrate 40%	13/26-N18	1
Fagron	Isosorbide dinitrate 40%	11F28-N05	1
Fagron	Isosorbide dinitrate 40%	11J17-No5	1
Fagron	Isosorbide dinitrate 40%	13F27-N040234/1300	1
Caelo	Isosorbide dinitrate 40%	13F27-N04	1
Fagron	Isosorbide dinitrate 40%	13I26-N18	10
Fagron	Isosorbide dinitrate 40%	149168	3
Fagron	Isosorbide dinitrate 40%	14D09-B03294282	1
Sanacorp	Isosorbide dinitrate 40%	14D09-B03-294280	1
Fagron	Isosorbide dinitrate 40%	14D09-B03-294281	4
ebe a	Isosorbide dinitrate 40%	14D09-B03-294281	1
AHD 09.03.2015	Isosorbide dinitrate 40%	14D09-B03-294281	1
Fagron	Isosorbide dinitrate 40%	14D09-B03-294282Eber	1
Allianz Healthcare 17.0...	Isosorbide dinitrate 40%	14D09-B03-300234	1
Fagron	Isosorbide dinitrate 40%	14-D09-B03-300234	1
Caelo	Isosorbide dinitrate 40%	14D-09-B03-300234	1
Caelo	Isosorbide dinitrate 40%	14D09-B03-307018	1
Caelo	Isosorbide dinitrate 40%	14D09-B03-308419	2
Fagron	Isosorbide dinitrate 40%	15/10-B01	1
Fagron	Isosorbide dinitrate 40%	14D09-B03-313566	1
Wepa	Isosorbide dinitrate 40%	14D09-B03-313566	1
Fagron	Isosorbide dinitrate 40%	14D09-B3-308419	1
Fagron	Isosorbide dinitrate 40%	15/10-B01-315217	3
Noweda	Isosorbide dinitrate 40%	15/10-B01-315217	1
Fargon	Isosorbide dinitrate 40%	15/10-B01-320081	1
Fagron	Isosorbide dinitrate 40%	15/10-B01-320081	3
Anzag	Isosorbide dinitrate 40%	1510B01315217	1

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Supplier	Substance	Batch	Spectra
Fagron	Isosorbide dinitrate 40%	15/10-B01-325474	1
Fagron	Isosorbide dinitrate 40%	1510-B01320081	1
Fagron	Isosorbide dinitrate 40%	1510B01320081	1
Caelo	Isosorbide dinitrate 40%	1510-B01-315217	1
Fagron	Isosorbide dinitrate 40%	1510-B01-320081	1
Fagron	Isosorbide dinitrate 40%	1510B01328577	1
Fagron	Isosorbide dinitrate 40%	15I10-B01-315217	3
Fagron	Isosorbide dinitrate 40%	15I10-B01-310081	1
Fagron	Isosorbide dinitrate 40%	15I10-B01-320081	3
Fagron	Isosorbide dinitrate 40%	15I10-B01	1
Fagron	Isosorbide dinitrate 40%	15I10-B01-320782	2
Fagron	Isosorbide dinitrate 40%	15I10B01320081	1
Fagron	Isosorbide dinitrate 40%	15I10-B01-325474	2
Ebert-Jacobi	Isosorbide dinitrate 40%	15I10-B01-328132	1
Frago/Gehe	Isosorbide dinitrate 40%	17C29-B01-335070	1
Fagron	Isosorbide dinitrate 40%	15I10-B01-328577	2
Fagron	Isosorbide dinitrate 40%	15l10-B01-320081	1
Frago/Noweda	Isosorbide dinitrate 40%	15I10-B01-328577	1
Fagron	Isosorbide dinitrate 40%	2114M3516	1
Fagron	Isosorbide dinitrate 40%	3115M-03516	1
Fagron	Isosorbide dinitrate 40%	17C29-B01-335070	1
Fagron	Isosorbide dinitrate 40%	3211U-03516	1
Fagron	Isosorbide dinitrate 40%	9101205	1
Fagron	Isosorbide dinitrate 40%	4314U-03516	1
Fagron	Isosorbide dinitrate 40%	X12010	1
Fagron	Isosorbide dinitrate 40%	testxx	1
Fagron	Isosorbide dinitrate 40%	9E05-N05	2
Fagron	Isosorbide dinitrate 40%	10D29-N10	1
Noweda	Isosorbide dinitrate 40%	10G15-N01	1
Fagron	Isosorbide dinitrate 40%	11/17-N05	1
Fagron	Isosorbide dinitrate 40%	10029-N10	1
Fagron	Isosorbide dinitrate 40%	11/17-No5	1
FARGON	Isosorbide dinitrate 40%	11f20-n05	1
Fagron	Isosorbide dinitrate 40%	11I17-N05	1
Phönix 22.11.2012	Isosorbide dinitrate 40%	11F28-N05	1
Anzag 11.04.12	Isosorbide dinitrate 40%	11F28-N05	1
Fagron	Isosorbide dinitrate 40%	11J17-N05	1
Fagron	Isosorbide dinitrate 40%	11117-N05	1
Sanacorp	Isosorbide dinitrate 40%	11J17-N05	1
Fagron	Isosorbide dinitrate 40%	1216M-03516	1
Fiebig 23.05.13 ek: 10,...	Isosorbide dinitrate 40%	12F08-N04	1
Fagron	Isosorbide dinitrate 40%	12K14-N02	7
Fagron	Isosorbide dinitrate 40%	12FO8NO4	1
Phönix, 25.09.2013	Isosorbide dinitrate 40%	12K14-N02	1
Fagron	Isosorbide dinitrate 40%	12K14NO2	1
Fagron	Isosorbide dinitrate 40%	1309210009	1
Fagron	Isosorbide dinitrate 40%	13A07-0003	1
Fagron	Isosorbide dinitrate 40%	13A07-N13	6
Phönix	Isosorbide dinitrate 40%	13A07-N13	1
Fagron	Isosorbide dinitrate 40%	13d15-n02	1
Caelo	Isosorbide dinitrate 40%	13D15-N02	3
Fagron	Isosorbide dinitrate 40%	13D15-No2	1
Fagron	Isosorbide dinitrate 40%	2405210009	1
Fagron	Isosorbide dinitrate 40%	3413U03516	1
Fagron	Isosorbide dinitrate 40%	2413Q03516	1
Fagron	Isosorbide dinitrate 40%	26061207	1
Fagron	Isosorbide dinitrate 40%	391311-03516	1
Fagron	Isosorbide dinitrate 40%	P11008	2
Euro OTC	Isosorbide dinitrate 40%		1

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- 76 932 spectra from 463 *Apo-Ident* customers from a total of 25 460 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Isosorbide dinitrate 40%* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Isosorbide dinitrate 40%* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	159	0	72 274
Type B	0	110	0	161 963
Type C	0	220	7	76 932

The substance/substance group *Isosorbide dinitrate 40%* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2264 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 94.5455 %)
Type C	100.0000 % (> 99.8850 %)	96.9163 % (> 95.5947 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20891	23200	4.66	43.27
21347	23200	3.20	45.13
23200	23200	0.00	45.17
24057	23200	11.90	44.55

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Isoxuprine hydrochloride**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	22640-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Isoxuprine hydrochloride; Isoxsuprini hydrochloridum

Special notes

When selecting the *Isoxuprine hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Isoxuprine hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Isoxuprine hydro…	161770	22640	40	20160818*
Euro OTC	Isoxuprine hydro…	1503008-01	22659	40	20150430

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 80 spectra of 2 reference samples from the substance/substance group *Isoxuprine hydrochloride*. These samples are listed above in the section *calibration samples*. The reference samples originate from 2 different batches.

- 72 353 spectra from a total of 1580 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 40 spectra from 1 reference samples of the substance/substance group *Isoxuprine hydrochloride*.

- These include spectra of independent samples from 1 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Isoxuprine hydrochloride	16177001	22735	40

- 162 033 spectra from a total of 3498 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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- 0 spectra from 0 *Apo-Ident* customers from 0 batches from the substance/substance group *Isoxuprine hydrochloride*.

- These include spectra of independent samples from 0 batches, of which no spectra have been used for the generation of the database.

- 77 159 spectra from 463 *Apo-Ident* customers from a total of 25 547 batches from a further 701 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Isoxuprine hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Isoxuprine hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	72 353
Type B	0	40	0	162 033
Type C	0	0	0	77 159

The substance/substance group *Isoxuprine hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 99.8849 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
22640	22640	0.00	46.12
22659	22640	8.48	44.71

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Ketamine hydrochloride**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20278-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Ketamine hydrochloride; Ketamini hydrochloridum; Ketaminum hydrochloricum

Special notes

When selecting the *Ketamine hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Ketamine hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Ketamine hydroch…	13H19-N01	21044	40	8931
Fagron	Ketamine hydroch…	14I03-B02-303165	21779	40	20140926
Fagron	Ketamine hydroch…	14I03-B02-311706	22533	40	20140926

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Ketamine hydrochloride*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 140 spectra from 4 reference samples of the substance/substance group *Ketamine hydrochloride*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Ketamine hydrochloride	11A27-N13	20278	40
Fagron	Ketamine hydrochloride	14I03-B02-303165	21779†	20
Fagron	Ketamine hydrochloride	15E07-B03-322164	23201	40
Fagron	Ketamine hydrochloride	16E18-B03-339897	23941	40

- 161 933 spectra from a total of 3495 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 19 spectra from 9 *Apo-Ident* customers from 15 batches from the substance/substance group *Ketamine hydrochloride*.

- These include spectra of independent samples from 14 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Noweda	Ketamine hydrochloride	292414P	1
GEHE 27.05.2014	Ketamine hydrochloride	13H19-N01	1
Fagron	Ketamine hydrochloride	182513P	1
Fagron	Ketamine hydrochloride	14/03-B02-303165	1
Fagron	Ketamine hydrochloride	14I03-B02	1
Fagron	Ketamine hydrochloride	14I03-B02-309852	1
Noweda	Ketamine hydrochloride	14/03-B02-311706	1
Fagron	Ketamine hydrochloride	15E07-B03-314085	1
Fagron	Ketamine hydrochloride	15E07-B03-322164	5
phönix	Ketamine hydrochloride	14I03-B02-311706	1
Fagron	Ketamine hydrochloride	16E18-B03-328264	1
Fagron	Ketamine hydrochloride	16E18-B03	1
Fagron	Ketamine hydrochloride	16E18-B03-332957	1
Fagron	Ketamine hydrochloride	16E18-B03-334370	1
Fagron	Ketamine hydrochloride	12F01-N11	1

- 77 140 spectra from 463 *Apo-Ident* customers from a total of 25 532 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Ketamine hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ketamine hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	100	40	161 933
Type C	0	11	8	77 140

The substance/substance group *Ketamine hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	71.4286 % (> 69.2857 %)
Type C	100.0000 % (> 99.8850 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21044	21044	0.00	72.93
21779	21044	4.62	73.30
22533	21044	17.75	70.58

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Ketoconazole**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20688-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Ketoconazole; Ketoconazolum

Special notes

When selecting the *Ketoconazole* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Ketoconazole*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Ketoconazole	12171007	20688	40	1401554
Fagron	Ketoconazole	12A16-N06	20699	40	20120123
Caelo	Ketoconazole	13179612	21514	40	20130613
Caelo	Ketoconazole	13179612	21515	40	20130613

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 4 reference samples from the substance/substance group *Ketoconazole*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 273 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 200 spectra from 6 reference samples of the substance/substance group *Ketoconazole*.

- These include spectra of independent samples from 4 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Ketoconazole	10J18-N07	20275	40
Caelo	Ketoconazole	13179612	21514†	20
Caelo	Ketoconazole	13179612	21515†	20
Fagron	Ketoconazole	16A26-B01-322982	23183	40
Fagron	Ketoconazole	17H14-B01-339422	23917	40
Caelo	Ketoconazole	153477	24028	40

- 161 873 spectra from a total of 3494 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B*

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 67 spectra from 42 *Apo-Ident* customers from 38 batches from the substance/substance group *Ketoconazole*.

- These include spectra of independent samples from 36 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Ketoconazole	13179610	4
Caelo	Ketoconazole	12300407	4
Caelo	Ketoconazole	13179606	3
Caelo	Ketoconazole	12300415	1
Fagron	Ketoconazole	13179612	1
Caelo	Ketoconazole	13179612	1
Caelo	Ketoconazole	13399404	8
Caelo	Ketoconazole	13399408	5
ANZAG 23.07.14	Ketoconazole	13h09-n07	1
Caelo	Ketoconazole	13399412	1
Fagron	Ketoconazole	13J23-N04	1
Caeolo /Gehe	Ketoconazole	14350408	1
Fagron	Ketoconazole	13H09-N07	1
Caelo	Ketoconazole	14350408	1
Caelo	Ketoconazole	14350416	1
Caelo	Ketoconazole	14350419	1
Caelo	Ketoconazole	14350421	1
Caelo	Ketoconazole	14350427	1
Caelo	Ketoconazole	14350422	2
Caelo	Ketoconazole	14350429	1
Caelo	Ketoconazole	14350442	2
Fagron	Ketoconazole	14E09-B01-293736	2
Fagron	Ketoconazole	14K04-B06-309671	1
Caelo	Ketoconazole	14350436	1
Caelo	Ketoconazole	14350437	1
Caelo	Ketoconazole	11070001	1
Caelo	Ketoconazole	11070022	2
Caelo	Ketoconazole	12171007	1
Gehe	Ketoconazole	11070019	1
Caelo	Ketoconazole	53317046	2
Fagron	Ketoconazole	15G23-B03-312063	1
anzag, 14.11.2012	Ketoconazole	12171008	1
Caelo	Ketoconazole	12171008	1
Phönix	Ketoconazole	12171018	1
Fagron	Ketoconazole	12I17-N02	1
Caelo	Ketoconazole	12300406	1
Fagron	Ketoconazole	12I17-N02	1
Caelo	Ketoconazole	13179601	1
Phönix	Ketoconazole	13179602	3
Fagron	Ketoconazole	5015E-02866	1
Fagron	Ketoconazole	14E09-B01-297637	1

- 77 092 spectra from 463 *Apo-Ident* customers from a total of 25 509 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Ketoconazole* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ketoconazole* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	72 273
Type B	0	190	10	161 873
Type C	0	64	3	77 092

The substance/substance group *Ketoconazole* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9928 %)	95.0000 % (> 93.5000 %)
Type C	100.0000 % (> 99.8850 %)	95.5224 % (> 91.0448 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20688	20688	0.00	84.91
20699	20688	8.09	84.24
21514	20688	4.65	85.55
21515	20688	4.84	84.15

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Lactose monohydrate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20029-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Lactose monohydrate; Lactosum monohydricum; Saccharum lactis

Special notes

When selecting the *Lactose monohydrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Lactose monohydrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Lactose monohydr…	12139910	20685	40	20120606
Caelo	Lactose monohydr…	14025601	21525	40	20140207
Euro OTC	Lactose monohydr…	1509030	21935	40	20151013*
Caelo	Lactose monohydr…	160277	22460	40	20160321*
Euro OTC	Lactose monohydr…	1606025	22701	40	20160628*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 200 spectra of 5 reference samples from the substance/substance group *Lactose monohydrate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 5 different batches.

- 72 233 spectra from a total of 1577 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 390 spectra from 11 reference samples of the substance/substance group *Lactose monohydrate*.

- These include spectra of independent samples from 5 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Lactose monohydrate	83278189	20029	30
Caelo	Lactose monohydrate	14025601	21526	40
Caelo	Lactose monohydrate	14025601	21527	40
Caelo	Lactose monohydrate	14025601	21528	40
Caelo	Lactose monohydrate	14025601	21529	40
Euro OTC	Lactose monohydrate	1509030	21935†	20
Caelo	Lactose monohydrate	160277	22460†	20
Caelo	Lactose monohydrate	15236220	22584	40
Euro OTC	Lactose monohydrate	1703019	23141	40
Caelo	Lactose monohydrate	173360	23828	40
Euro OTC	Lactose monohydrate	1802002	23962	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*).

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- 161 683 spectra from a total of 3491 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 877 spectra from 198 *Apo-Ident* customers from 344 batches from the substance/substance group *Lactose monohydrate*.

- These include spectra of independent samples from 342 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Lactose monohydrate	3031501	1
Caelo	Lactose monohydrate	3121406	1
Caelo	Lactose monohydrate	3091405	1
Eigenherstellung	Lactose monohydrate	40815HMS01	1
Caelo	Lactose monohydrate	5061504	1
Caelo	Lactose monohydrate	7031402	1
Eigenherstellung	Lactose monohydrate	60814HSA01	1
Caelo	Lactose monohydrate	8071501	1
Caelo	Lactose monohydrate	7111402	1
Caelo	Lactose monohydrate	9051401	1
Anzag/Fragon	Lactose monohydrate	1005SLP	1
Caelo	Lactose monohydrate	10195107	3
Fagron	Lactose monohydrate	10751120	1
Caelo	Lactose monohydrate	12041401	1
Caelo	Lactose monohydrate	123Test	1
Caelo	Lactose monohydrate	12399107	1
Caelo	Lactose monohydrate	123test	1
Euro OTC	Lactose monohydrate	1301028-01	9
Phönix/Euro	Lactose monohydrate	1301028-02	2
Euro OTC	Lactose monohydrate	1301028-02	15
Fagron	Lactose monohydrate	13/23-B03-291114	1
Gehe	Lactose monohydrate	1301028-02	1
otz pharma	Lactose monohydrate	130102802	1
Caelo	Lactose monohydrate	13104901	8
Caelo	Lactose monohydrate	13104909	5
Phoenix 19.03.2014	Lactose monohydrate	13104909	1
Caelo	Lactose monohydrate	13104910	3
Caelo	Lactose monohydrate	13104911	3
Caelo	Lactose monohydrate	13299101	11
Caelo	Lactose monohydrate	13299102	14
Caelo	Lactose monohydrate	13299103	2
Caelo	Lactose monohydrate	13299107	6
Caelo	Lactose monohydrate	13299106	2
Caelo	Lactose monohydrate	13299108	5
Sanacorp	Lactose monohydrate	13299108	1
GEHE am 17.06.2014	Lactose monohydrate	13299108	1

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Hence, these spectra are not independent and are not of *Type B*.

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Supplier	Substance	Batch	Spectra
Bombastus	Lactose monohydrate	13299108	1
Caelo	Lactose monohydrate	13299112	1
Fagron	Lactose monohydrate	13E23-B01-283332	4
Fagron	Lactose monohydrate	13I23-B03-287414	1
Fagron	Lactose monohydrate	13I23-B03	4
AHD	Lactose monohydrate	13I23-B03-291114	1
Fagron	Lactose monohydrate	13I23-B03-291115	1
Fagron	Lactose monohydrate	13I23-B03-291116	1
Fagron	Lactose monohydrate	13J23-B03-291114	1
Euro OTC	Lactose monohydrate	1401003	1
Euro OTC	Lactose monohydrate	1401003-01	13
gehe	Lactose monohydrate	1401003-01	2
Caelo	Lactose monohydrate	1401003-01	1
EuRho/Phönix	Lactose monohydrate	1401003-01	2
EuRho	Lactose monohydrate	1401003-01	3
Euro OTC	Lactose monohydrate	1401003-02	4
Europ Ots Pharma	Lactose monohydrate	1401003-02	1
Euroo/Phoenix	Lactose monohydrate	1401003-02	1
Euro/Phönix	Lactose monohydrate	1401003-02	1
Bahnhof-Apotheke	Lactose monohydrate	140220	1
Caelo	Lactose monohydrate	1402504	1
Caelo	Lactose monohydrate	14025601	3
Noweda	Lactose monohydrate	14025601	1
Caelo	Lactose monohydrate	14025603	7
	Lactose monohydrate	14025604	1
Caelo	Lactose monohydrate	14025604	10
Caelo	Lactose monohydrate	14025608	2
Caelo	Lactose monohydrate	14025611	1
Caelo	Lactose monohydrate	14025615	1
Phönix	Lactose monohydrate	14025616	1
Caelo	Lactose monohydrate	14025616	6
Caelo	Lactose monohydrate	14025619	4
Caelo	Lactose monohydrate	14025620	11
Sanacorp	Lactose monohydrate	14025620	1
Caesar u. Loretz	Lactose monohydrate	14025620	1
Phoenix	Lactose monohydrate	1404PLV-1928	4
Caelo	Lactose monohydrate	14140302	4
Caelo	Lactose monohydrate	14140304	4
Caelo	Lactose monohydrate	14140305	7
Gehe	Lactose monohydrate	14140306	1
Caelo	Lactose monohydrate	14140306	2
Caelo	Lactose monohydrate	14140308	6
Caelo	Lactose monohydrate	14140309	2
Fagron	Lactose monohydrate	14140312	1
Caesar & Loretz GmbH	Lactose monohydrate	14140311	1
Caelo	Lactose monohydrate	14140312	13
Caelo	Lactose monohydrate	14333501	4
Caelo	Lactose monohydrate	14333503	1
Caelo	Lactose monohydrate	14333502	2
Caelo	Lactose monohydrate	14333508	1
Caelo	Lactose monohydrate	14333509	10
Sanacorp	Lactose monohydrate	14333509	1
Caelo	Lactose monohydrate	14333510	1
Hedinger	Lactose monohydrate	14333511	3
Caelo	Lactose monohydrate	143335114	1
Caelo	Lactose monohydrate	14333513	5
Fagron	Lactose monohydrate	14333518	1
Caelo	Lactose monohydrate	14333514	1
Sanacorp	Lactose monohydrate	14333518	1
Caelo	Lactose monohydrate	14333518	3

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Supplier	Substance	Batch	Spectra
Caelo	Lactose monohydrate	14333520	8
Caelo	Lactose monohydrate	14333521	6
Fagron	Lactose monohydrate	14333525	1
Caelo	Lactose monohydrate	14333528	2
Caelo	Lactose monohydrate	1433502	1
Caelo	Lactose monohydrate	1433510	1
Caelo	Lactose monohydrate	1433520	1
Caesar u Loretz	Lactose monohydrate	1433520	1
Caelo	Lactose monohydrate	14335313	1
Caelo	Lactose monohydrate	1433521	1
Fagron	Lactose monohydrate	14A30-B07	2
Fagron	Lactose monohydrate	14H27-B01-305666	1
Fagron	Lactose monohydrate	14H27-B02	1
Fagron	Lactose monohydrate	14H27-B02-302033	1
Euro OTC	Lactose monohydrate	15010	1
Euro OTC	Lactose monohydrate	1501017-01	10
Caelo	Lactose monohydrate	1501017-01	4
EuRho	Lactose monohydrate	1501017-01	1
Euro OTC	Lactose monohydrate	150101701	1
Caelo	Lactose monohydrate	15011701	1
Euro OTC	Lactose monohydrate	1501017-02	1
Euro OTC	Lactose monohydrate	1509030-01	6
Rondell Apotheke	Lactose monohydrate	1509030-01	2
Euro OTC	Lactose monohydrate	1509030-02	1
Caelo	Lactose monohydrate	1509030-02	1
Euro OTC	Lactose monohydrate	15090-30-02	1
Caelo	Lactose monohydrate	150903002	1
Caelo	Lactose monohydrate	15236201	14
EuRho	Lactose monohydrate	1509030-02	1
Euro OTC	Lactose monohydrate	150903002	1
Caelo	Lactose monohydrate	15236203	1
Caelo	Lactose monohydrate	15236202	1
Caelo	Lactose monohydrate	15236204	8
Caesar & Loretz/Noweda	Lactose monohydrate	15236204	1
Caelo	Lactose monohydrate	15236206	1
Caelo	Lactose monohydrate	15236208	10
pharmachem	Lactose monohydrate	15236208	1
Caelo	Lactose monohydrate	15236209	7
Caelo	Lactose monohydrate	15236213	1
Caelo	Lactose monohydrate	15236214	6
Caelo	Lactose monohydrate	15236215	4
Ebert u. Jacobi 18.0...	Lactose monohydrate	15236215	1
Caelo	Lactose monohydrate	15236217	1
Caelo	Lactose monohydrate	15236220	5
Caelo	Lactose monohydrate	15236221	5
Fagron	Lactose monohydrate	15A19-B06	3
Caelo	Lactose monohydrate	1526201	1
Phoenix	Lactose monohydrate	15A19-B06	3
Fagron	Lactose monohydrate	15A19-B06-303437	3
Fagron	Lactose monohydrate	15A19-B06-303439	3
Fagron	Lactose monohydrate	15H14-B03-314451	3
Caelo	Lactose monohydrate	16027701	3
Caelo	Lactose monohydrate	16027702	5
Caelo	Lactose monohydrate	16027703	3
Caelo	Lactose monohydrate	16027704	2
Caelo	Lactose monohydrate	16027706	5
Caelo	Lactose monohydrate	16027707	1
Caelo	Lactose monohydrate	16027708	3
Alte Apotheke	Lactose monohydrate	16027708	1
Euro OTC	Lactose monohydrate	1606025-01	10

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Supplier	Substance	Batch	Spectra
Chiesi	Lactose monohydrate	16027708	1
Euro OTC	Lactose monohydrate	160602501	1
Euro OTC	Lactose monohydrate	1606025-02	2
Caelo	Lactose monohydrate	16231201	3
Caelo	Lactose monohydrate	16231202	7
Caesar u Loretz	Lactose monohydrate	16231202	1
phönix	Lactose monohydrate	16231202	1
Caelo	Lactose monohydrate	16231203	2
Caelo	Lactose monohydrate	16231206	4
Caelo	Lactose monohydrate	16231207	5
Caelo	Lactose monohydrate	16231208	3
Caelo	Lactose monohydrate	1623120803815470	1
Caelo	Lactose monohydrate	16231211	4
Gehe	Lactose monohydrate	16231211	1
gehe	Lactose monohydrate	16231211	1
Caelo	Lactose monohydrate	16231214	3
Caelo	Lactose monohydrate	16231212	1
Bombastus	Lactose monohydrate	17000754	1
Fagron	Lactose monohydrate	1623123	1
Bombastus	Lactose monohydrate	17001199	1
Bombastus	Lactose monohydrate	17001212	1
Caelo	Lactose monohydrate	1703019-01	1
Fagron	Lactose monohydrate	17078302	1
Caelo	Lactose monohydrate	17078306	3
Caelo	Lactose monohydrate	17078307	1
Caelo	Lactose monohydrate	17078312	1
Caelo	Lactose monohydrate	17321001	1
Caelo	Lactose monohydrate	200415HJK02	1
Caelo	Lactose monohydrate	17321004	1
Euro OTC	Lactose monohydrate	18082014A	1
Caelo	Lactose monohydrate	23051501	1
Caelo	Lactose monohydrate	23101404	1
Caelo	Lactose monohydrate	26071401	1
Bombastus	Lactose monohydrate	286354	1
Caelo	Lactose monohydrate	23061504	1
Bombastus	Lactose monohydrate	286710	1
Bombastus	Lactose monohydrate	291464	1
Bombastus	Lactose monohydrate	292982	2
Bombastus	Lactose monohydrate	292995	1
Bombastus	Lactose monohydrate	292983	1
Bombastus	Lactose monohydrate	292996	1
Bombastus	Lactose monohydrate	2932880	1
Bombastus	Lactose monohydrate	293074	1
Bombastus	Lactose monohydrate	293289	1
Bombastus	Lactose monohydrate	293290	1
Bombastus	Lactose monohydrate	293970	1
Bombastus	Lactose monohydrate	293649	1
Bombastus	Lactose monohydrate	293918/0	1
Bombastus	Lactose monohydrate	294154	1
Bombastus	Lactose monohydrate	294184/0	1
Bombastus	Lactose monohydrate	294897/0	1
Bombastus	Lactose monohydrate	295011/0	1
Bombastus	Lactose monohydrate	295476	1
Bombastus	Lactose monohydrate	295714	1
Bombastus	Lactose monohydrate	295715	1
Caelo	Lactose monohydrate	30031503	1
Bombastus	Lactose monohydrate	300657	2
Bombastus	Lactose monohydrate	303658	2
Bombastus	Lactose monohydrate	3020165	1
Bombastus	Lactose monohydrate	304755	1

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Supplier	Substance	Batch	Spectra
Bombastus	Lactose monohydrate	305227	2
Bombastus	Lactose monohydrate	305227/0	1
Bombastus	Lactose monohydrate	305336	2
Bombastus	Lactose monohydrate	305336/0	1
Bombastus	Lactose monohydrate	306147	3
Bombastus	Lactose monohydrate	306651/0	1
Bombastus	Lactose monohydrate	306652	1
Bombastus	Lactose monohydrate	306850	1
Bombastus	Lactose monohydrate	306989	2
Bombastus	Lactose monohydrate	306964	1
Bombastus	Lactose monohydrate	306990	1
Bombastus	Lactose monohydrate	307444/0	1
Bombastus	Lactose monohydrate	307543	2
Bombastus	Lactose monohydrate	307741	1
Bombastus	Lactose monohydrate	307702/0	1
Bombastus	Lactose monohydrate	307573/0	1
Bombastus	Lactose monohydrate	3077410	1
Bombastus	Lactose monohydrate	307976/0	1
Bombastus	Lactose monohydrate	308117	1
Bombastus	Lactose monohydrate	308438	1
Bombastus	Lactose monohydrate	308117/0	1
Bombastus	Lactose monohydrate	308118/0	1
Bombastus	Lactose monohydrate	309351	1
Bombastus	Lactose monohydrate	309413/0	1
	Lactose monohydrate	309351/0	1
Bombastus	Lactose monohydrate	309508	1
	Lactose monohydrate	309508/0	1
Bombastus	Lactose monohydrate	309509	1
Bombastus	Lactose monohydrate	309509/0	1
Bombastus	Lactose monohydrate	310691	1
Bombastus	Lactose monohydrate	310082/0	1
Bombastus	Lactose monohydrate	310912/0	1
Bombastus	Lactose monohydrate	310691/0	1
Bombastus	Lactose monohydrate	311280/0	1
Bombastus	Lactose monohydrate	311362/0	1
Gatt-Koller	Lactose monohydrate	5580/12120813	2
Bombastus	Lactose monohydrate	310905/0	1
Euro OTC	Lactose monohydrate	5123	1
Bombastus	Lactose monohydrate	311280	1
Euro OTC	Lactose monohydrate	3215A-02210	1
Bombastus	Lactose monohydrate	310905	1
Euro OTC	Lactose monohydrate	L1237A4172	2
Caelo	Lactose monohydrate	1071302	1
Eigenherstellung	Lactose monohydrate	30912HML01	1
Caelo	Lactose monohydrate	6091301	1
Eigenherstellung	Lactose monohydrate	40113HJK01	1
Eigenherstellung	Lactose monohydrate	70113HML01	1
Caelo	Lactose monohydrate	8021401	1
Alliance Healthcare	Lactose monohydrate	10195101	1
Europharm/Otto	Lactose monohydrate	1106022-01	1
Caelo	Lactose monohydrate	11014714	1
Gehe	Lactose monohydrate	1106022-02	2
Noweda	Lactose monohydrate	1106022-02	1
Caelo	Lactose monohydrate	11079002	2
Caelo	Lactose monohydrate	1106022-02	1
Euro OTC	Lactose monohydrate	110602202	1
Eigenherstellung	Lactose monohydrate	110913HJK01	1
EuRho	Lactose monohydrate	1112020-01	1
Euro OTC	Lactose monohydrate	1112020-01	3
vdl	Lactose monohydrate	1112020-01	2

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Supplier	Substance	Batch	Spectra
Gehe	Lactose monohydrate	1112020-01	2
Gehe	Lactose monohydrate	1112020-02	7
Euro OTC	Lactose monohydrate	1112020-02	5
Gehe	Lactose monohydrate	11120220-01	1
Caelo	Lactose monohydrate	11219208	3
Caelo	Lactose monohydrate	11219216	4
Fagron	Lactose monohydrate	11L22-N03	1
Fagron	Lactose monohydrate	11C29-N06	1
Fagron	Lactose monohydrate	12/23-B02-287554	1
Caelo	Lactose monohydrate	12021502	2
Caelo	Lactose monohydrate	12021507	3
Caelo	Lactose monohydrate	12021508	2
GEHE	Lactose monohydrate	12021508	1
Caelo	Lactose monohydrate	12021518	12
Bahnhof-Apotheke	Lactose monohydrate	120614	1
Bahnhof-Apotheke Kempten	Lactose monohydrate	120808	1
Bahnhof-Apotheke	Lactose monohydrate	120808	1
Bahnhof-Apotheke	Lactose monohydrate	121119	2
Caelo	Lactose monohydrate	12139901	4
Caelo	Lactose monohydrate	12139909	1
Caelo	Lactose monohydrate	12139910	3
Herbasinica	Lactose monohydrate	12139910	1
Caelo	Lactose monohydrate	12139914	6
Anzag 29.11.12 ek:7,51	Lactose monohydrate	12139914	1
Anzag	Lactose monohydrate	12139915	5
Caelo	Lactose monohydrate	12139915	4
Caelo	Lactose monohydrate	12139920	6
Caelo	Lactose monohydrate	12336801	6
Caelo	Lactose monohydrate	12336803	1
Caelo	Lactose monohydrate	12336804	1
Caelo	Lactose monohydrate	12336814	1
Caelo	Lactose monohydrate	12336815	11
Noweda/ Caesar&Loretz	Lactose monohydrate	12336815	1
Anzag 11.06.2013	Lactose monohydrate	12336815	1
Sanacorp	Lactose monohydrate	12336815	1
Phönix	Lactose monohydrate	12336815	1
cesar&lorentz/Phönix	Lactose monohydrate	12336815	1
Caelo	Lactose monohydrate	12336816	5
Caelo	Lactose monohydrate	12336820	4
Caelo	Lactose monohydrate	12336821	1
Fagron	Lactose monohydrate	12C26-N05	1
Fagron	Lactose monohydrate	12C09-N04	1
Fagron	Lactose monohydrate	12G27-N02	5
Fagron	Lactose monohydrate	13/23-B02-287554	1
Euro OTC	Lactose monohydrate	130102801	1
EuRho	Lactose monohydrate	1301028-01	1
Sanacorp	Lactose monohydrate	1301028-01	1
EuRho	Lactose monohydrate	1301028-02	3
Bahnhof-Apotheke	Lactose monohydrate	130115	1
Caelo	Lactose monohydrate	1301C005	2
Fagron	Lactose monohydrate	1301C005-278129	2
Fagron	Lactose monohydrate	1301C006-278128	4
Fagron	Lactose monohydrate	1301C007-278131	1
Caelo	Lactose monohydrate	1301C006-278128	1
Fagron	Lactose monohydrate	1301C008-278130	1
Fagron	Lactose monohydrate	1303C001	1
Fagron	Lactose monohydrate	1303C001-280388	2
Fagron	Lactose monohydrate	1303C002-280398	1
Fagron	Lactose monohydrate	1303C003-280390	1
Fagron	Lactose monohydrate	1303C003	1

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Supplier	Substance	Batch	Spectra
Bahnhof-Apotheke	Lactose monohydrate	130911	1
Fagron	Lactose monohydrate	13088R	1
Caelo	Lactose monohydrate	13081302	1
Bahnhof-Apotheke	Lactose monohydrate	130925	1
Bahnhof-Apotheke	Lactose monohydrate	130729	1
Fagron	Lactose monohydrate	13096R	1
Cealo	Lactose monohydrate	13104901	1
gehe 12.09.13	Lactose monohydrate	13104901	1
Caelo	Lactose monohydrate	13104902	8
Caelo	Lactose monohydrate	13104908	3
Phönix	Lactose monohydrate	13299102	2
Sanacorp	Lactose monohydrate	13299102	1
schubert / Phoenix	Lactose monohydrate	1334PLV-1775	1
Fagron	Lactose monohydrate	13E23-B01	2
Fagron	Lactose monohydrate	13E23-B01-283334	2
Euro OTC	Lactose monohydrate	140-1003-01	1
Bahnhof-Apotheke	Lactose monohydrate	140113	3
Caelo	Lactose monohydrate	160913PJK01	1
Caelo	Lactose monohydrate	17011302	1
Caelo	Lactose monohydrate	17011301	1
Caelo	Lactose monohydrate	20021411	1
Bombastus	Lactose monohydrate	272680/0	1
Caelo	Lactose monohydrate	24011405	1
Caelo	Lactose monohydrate	25011303	1
Bombastus	Lactose monohydrate	275194/0	1
Bombastus	Lactose monohydrate	275225/0	1
Bombastus	Lactose monohydrate	274926	1
Fagron	Lactose monohydrate	282567/0	1
Bombastus	Lactose monohydrate	282648	1
Bombastus	Lactose monohydrate	282696/0	1
Bombastus	Lactose monohydrate	283992	2
Bombastus	Lactose monohydrate	284321/0	1
Bombastus	Lactose monohydrate	286697/0	1
Bombastus	Lactose monohydrate	285087/0	1
Bombastus	Lactose monohydrate	288927	1
Bombastus	Lactose monohydrate	289238	1
Bombastus	Lactose monohydrate	288015/0	1
Caelo	Lactose monohydrate	30101201	1
Caelo	Lactose monohydrate	2901312210	1
Caelo	Lactose monohydrate	3108130l	1
Euro OTC	Lactose monohydrate	31102013A	1
Caelo	Lactose monohydrate	3788916	1
Caelo	Lactose monohydrate	4313Q2210	1
Caelo	Lactose monohydrate	6859858	1
Spangropharm	Lactose monohydrate	91444379	1
Caelo	Lactose monohydrate	s-100513-1	1
Bahnhof-Apotheke	Lactose monohydrate	140206	2
Bahnhof-Apotheke	Lactose monohydrate	140310	2
Caelo	Lactose monohydrate	140612	3
Caeo/Noweda	Lactose monohydrate	1523204	1
Sanacorp,05.04.17, 5,96EUR	Lactose monohydrate	16231202	1
Noweda	Lactose monohydrate	1112020-01	1
Caelo	Lactose monohydrate	11219217	1
Fagron	Lactose monohydrate	11H04-N04	1
Caelo	Lactose monohydrate	120403	1
Caelo	Lactose monohydrate	12139908	2
Caelo	Lactose monohydrate	12139912	2
Fagron	Lactose monohydrate	1301C006	1
Bahnhof-Apotheke	Lactose monohydrate	131112	1
Bahnhof-Apotheke	Lactose monohydrate	131127	2

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Supplier	Substance	Batch	Spectra
Bahnhof-Apotheke	Lactose monohydrate	131218	2
Euro OTC	Lactose monohydrate	1013Q-02210	1
Fagron	Lactose monohydrate	10726158	1
Fagron	Lactose monohydrate	14A30-B07-296182	2
Nachprüfung	Lactose monohydrate	3712Q-02210	1
Anzag / Noweda	Lactose monohydrate	12336815	1
Peter Kölln	Lactose monohydrate	229719241-0640	1
Caelo	Lactose monohydrate		1
Bahnhofsapotheke	Lactose monohydrate	140401	1
Bahnhof-Apotheke	Lactose monohydrate	140630	1
Fragon	Lactose monohydrate	10706040	1
	Lactose monohydrate	12021518	1
A.H.D.	Lactose monohydrate	12336801	1
Bahnhof-Apotheke	Lactose monohydrate	131023	1
Sanacorp	Lactose monohydrate	13104901	1
Sanacorp	Lactose monohydrate	13104909	1
Caelo	Lactose monohydrate	13104909-3422310182	1
Caelo	Lactose monohydrate	13104909-3453311172	1
Caelo	Lactose monohydrate	13104912	2

- 76 282 spectra from 463 *Apo-Ident* customers from a total of 25 212 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Lactose monohydrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Lactose monohydrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	200	0	72 233
Type B	0	390	0	161 683
Type C	0	874	3	76 282

The substance/substance group *Lactose monohydrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 98.4615 %)
Type C	100.0000 % (> 99.8849 %)	99.6579 % (> 99.3158 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to

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exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20685	22701	2.22	46.60
21525	21935	3.64	44.65
21935	21935	0.00	45.56
22460	22460	0.00	46.06
22701	22701	0.00	46.20

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Levocarnitine**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20357-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Levocarnitine; Levocarnitivum

Special notes

When selecting the *Levocarnitine* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Levocarnitine*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Levocarnitine	1210029-01	20809	40	20121130
Fagron	Levocarnitine	12H10-N07	20818	40	20120830
Fagron	Levocarnitine	14A20-B11-290728	21790	40	AR-15-FG-016322-01
Fagron	Levocarnitine	14A20-B11-290728	21968	40	AR-16-FG-005969-01
Fagron	Levocarnitine	15L04-B05-319229	23194	40	AR-17-FG-012937-01
Fagron	Levocarnitine	16L06-B03-338285	23919	40	20161227

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 240 spectra of 6 reference samples from the substance/substance group *Levocarnitine*. These samples are listed above in the section *calibration samples*. The reference samples originate from 5 different batches.

- 72 193 spectra from a total of 1577 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 265 spectra from 7 reference samples of the substance/substance group *Levocarnitine*.

- These include spectra of independent samples from 5 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Levocarnitine	11E18-N06	20285	45
Euro OTC	Levocarnitine	1106012-02	20357	40
Euro OTC	Levocarnitine	1303027-02	21648	60
Fagron	Levocarnitine	14A20-B11-290728	21790†	20
Fagron	Levocarnitine	14A20-B11-290728	21968†	20
Fagron	Levocarnitine	16F20-B01-326616	23402	40
Fagron	Levocarnitine	17K23-B01-345633	24009	40

- 161 808 spectra from a total of 3493 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 11 spectra from 7 *Apo-Ident* customers from 9 batches from the substance/substance group *Levocarnitine*.

- These include spectra of independent samples from 9 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Levocarnitine	13G19-N12	3
Fagron	Levocarnitine	9041504	1
Fagron	Levocarnitine	130526	1
Euro OTC	Levocarnitine	1303027	1
Euro OTC	Levocarnitine	7120	1
Euro OTC	Levocarnitine	1106012-020	1
Euro OTC	Levocarnitine	L1608038-01	1
Fagron	Levocarnitine	150104	1
Euro OTC	Levocarnitine	1303027-01	1

- 77 148 spectra from 463 *Apo-Ident* customers from a total of 25 539 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Levocarnitine* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Levocarnitine* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	240	0	72 193
Type B	0	220	45	161 808
Type C	0	10	1	77 148

The substance/substance group *Levocarnitine* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.5000 %)
Type B	100.0000 % (> 99.9928 %)	83.0189 % (> 81.8868 %)
Type C	100.0000 % (> 99.8851 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20809	23194	13.95	31.03
20818	23194	20.30	34.96
21790	21790	0.00	42.58
21968	21968	0.00	75.47
23194	23194	0.00	40.25
23919	23194	8.21	38.72

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Levothyroxin sodium**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	21708-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Levothyroxin sodium; Levothyroxinum natrii

Special notes

When selecting the *Levothyroxin sodium* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Levothyroxin sodium*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Levothyroxin sod…	14E28-B05-298322	21708	20	1506426
Fagron	Levothyroxin sod…	14E28-B05-306102	21820	40	20140915
Fagron	Levothyroxin sod…	14E28-B05-298322	21708SI	32	1506426
Fagron	Levothyroxin sod…	14E28-B05-306102	21820SI	38	20140915

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 130 spectra of 4 reference samples from the substance/substance group *Levothyroxin sodium*. These samples are listed above in the section *calibration samples*. The reference samples originate from 2 different batches.

- 72 303 spectra from a total of 1580 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 141 spectra from 7 reference samples of the substance/substance group *Levothyroxin sodium*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Levothyroxin sodium	14E28-B05-298322	21708†	10
Fagron	Levothyroxin sodium	14E28-B05-306102	21820†	20
Fagron	Levothyroxin sodium	16G25-B99-329080	23191	40
Fagron	Levothyroxin sodium	16G25-B99-324827	not required	17
Fagron	Levothyroxin sodium	14E28-B05-298322	21708SI†	15
Fagron	Levothyroxin sodium	14E28-B05-306102	21820SI†	15
Fagron	Levothyroxin sodium	16G25-B99-329080	23191SI	24

- 161 932 spectra from a total of 3495 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 0 spectra from 0 *Apo-Ident* customers from 0 batches from the substance/substance group *Levothyroxin sodium*.

- These include spectra of independent samples from 0 batches, of which no spectra have been used for the generation of the database.

- 77 159 spectra from 463 *Apo-Ident* customers from a total of 25 547 batches from a further 701 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Levothyroxin sodium* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Levothyroxin sodium* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	124	6	72 303
Type B	0	129	12	161 932
Type C	0	0	0	77 159

The substance/substance group *Levothyroxin sodium* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	95.3846 % (> 93.0769 %)
Type B	100.0000 % (> 99.9928 %)	91.4894 % (> 89.3617 %)
Type C	100.0000 % (> 99.8849 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested

reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

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Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21708	21708	0.00	80.58
21820	21708	19.95	90.91

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**L-glutathione**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20366-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

L-glutathione; L-Glutathionum

Special notes

When selecting the L-*glutathione* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group L-*glutathione*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	L-glutathione	1102019-02	21788	40	AR-15-FG-008218-01
Euro OTC	L-glutathione	1703008	23143	40	20170327*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 80 spectra of 2 reference samples from the substance/substance group L-*glutathione*. These samples are listed above in the section *calibration samples*. The reference samples originate from 2 different batches.

- 72 353 spectra from a total of 1580 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 140 spectra from 4 reference samples of the substance/substance group L-*glutathione*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Dr. Behr	L-glutathione	WE-11020045	20366	40
Euro OTC	L-glutathione	1102019-02	21788†	20
Euro OTC	L-glutathione	1711009	23729	40
Fagron	L-glutathione	18C01-B08-347604	24059	40

- 161 933 spectra from a total of 3495 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 9 spectra from 3 *Apo-Ident* customers from 8 batches from the substance/substance group L-*glutathione*.

- These include spectra of independent samples from 8 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	L-glutathione	14H21-B02	1
Dr. Behr GmbH	L-glutathione	WE14110006	1
Euro OTC	L-glutathione	1102019-01	1
Fagron	L-glutathione	11E02-N08	1
dr.Behr GmbH	L-glutathione	PF12E80201	2
dr.behr	L-glutathione	WE-12070001	1
dr.behr	L-glutathione	WE11020045	1
Dr. Behr GmbH	L-glutathione	WE14010014	1

- 77 150 spectra from 463 *Apo-Ident* customers from a total of 25 540 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group L-*glutathione* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with L-*glutathione* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	72 353
Type B	0	137	3	161 933
Type C	0	9	0	77 150

The substance/substance group L-*glutathione* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9928 %)	97.8571 % (> 95.7143 %)
Type C	100.0000 % (> 99.8851 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to

exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21788	21788	0.00	49.43
23143	23143	0.00	49.55

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Lidocaine**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20942-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Lidocaine; Lidocainum

Special notes

When selecting the *Lidocaine* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Lidocaine*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Lidocaine	13H05-N05	20942	40	1401378
Euro OTC	Lidocaine	1310023-01	21640	40	20131118
Caelo	Lidocaine	13352411	21673	40	20131115
Euro OTC	Lidocaine	1612021	22984	40	20170206*
Fagron	Lidocaine	16F21-B06-327232	23019	40	20160728

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 200 spectra of 5 reference samples from the substance/substance group *Lidocaine*. These samples are listed above in the section *calibration samples*. The reference samples originate from 5 different batches.

- 72 233 spectra from a total of 1577 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 280 spectra from 8 reference samples of the substance/substance group *Lidocaine*.

- These include spectra of independent samples from 6 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
zu erfassen	Lidocaine	zu erfassen	20148	40
Euro OTC	Lidocaine	1310023-01	21640†	20
Caelo	Lidocaine	13352411	21673†	20
Euro OTC	Lidocaine	1603027	22526	40
Caelo	Lidocaine	162895	22768	40
Caelo	Lidocaine	171831	23632	40
Euro OTC	Lidocaine	1801032	23960	40
Caelo	Lidocaine	180444	24031	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 793 spectra from a total of 3492 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 376 spectra from 163 *Apo-Ident* customers from 144 batches from the substance/substance group *Lidocaine*.

- These include spectra of independent samples from 140 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Lidocaine	5111201	1
Fagron	Lidocaine	214U-03584	1
Fagron	Lidocaine	515M-07006	1
Allianz Healthcare	Lidocaine	8565960	1
Fagron	Lidocaine	5122014A	1
Fagron	Lidocaine	6J23-No2	1
Caelo	Lidocaine	9205919	1
Phönix 29.03.2012	Lidocaine	9205906	1
Caelo	Lidocaine	9205922	1
Fagron	Lidocaine	1116E-07006	1
Fagron	Lidocaine	1113M-03584	1
Fagron	Lidocaine	11C09-N07	2
Fagron	Lidocaine	11D28-N12	2
Fagron	Lidocaine	11K17-N03	2
Fagron	Lidocaine	12/21-N06	2
Phönix, 12.11.2012	Lidocaine	12163801	1
Caelo	Lidocaine	12163801	5
Caelo	Lidocaine	12163802	2
Caelo	Lidocaine	12163803	3
Caelo	Lidocaine	12163804	4
Caelo	Lidocaine	12163810	1
Caelo	Lidocaine	12163811	4
Caesar/Lorenz	Lidocaine	12163813	1
Caelo	Lidocaine	12163813	5
Henry Lamotte Oils GmbH	Lidocaine		1
Caelo	Lidocaine	122294405	1
Caelo	Lidocaine	12294405	5
Caelo	Lidocaine	12294411	2
Caelo	Lidocaine	12294412	9
Caelo	Lidocaine	12294408	2
Caesar & Loretz GmbH	Lidocaine	12294412	1
Phönix 13.05.2013	Lidocaine	12B27-N04	1
Phönix Gotha	Lidocaine	12C08-N11	1
Fagron	Lidocaine	12E30-N10	11
Fagron	Lidocaine	12C08-N11	1
Fagron	Lidocaine	12c8-n11	1
Fargon	Lidocaine	12E30-N10	1
Anzag	Lidocaine	12E30-N10	1
Fagron	Lidocaine	12h16n05	1
Fagron	Lidocaine	12H16-N05	8

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Supplier	Substance	Batch	Spectra
Fagron	Lidocaine	12h16-N05	1
Fagron	Lidocaine	12H16-n05	1
Sanacorp	Lidocaine	12H16-N05	1
Noweda	Lidocaine	12H16-N05	1
Fagron	Lidocaine	12I12-N06	1
Gehe	Lidocaine	12H16-N05	1
Fagron	Lidocaine	12I21-N06	3
Fagron	Lidocaine	12I21N06	1
Sanacorp	Lidocaine	12I21-N06	1
Fagron	Lidocaine	12K13-N01	3
Anzag 07.03.2013	Lidocaine	12K13-N01	1
Euro OTC	Lidocaine	1310023-02	2
Caelo	Lidocaine	133524	1
Caelo	Lidocaine	13352405	2
Caelo	Lidocaine	13352403	1
Caelo	Lidocaine	13352406	1
Caelo	Lidocaine	13352408	8
Caelo	Lidocaine	13352411	6
Caelo	Lidocaine	13352413	3
Caelo	Lidocaine	13352414	2
Phönix	Lidocaine	13B27-N04	1
Caelo	Lidocaine	13352415	2
Fagron	Lidocaine	13B27-N04	9
Fagron	Lidocaine	13E28-B40-289433	1
Fagron	Lidocaine	13B27N04	1
Fagron	Lidocaine	13H05-N05	10
Gehe am 22.01.2014	Lidocaine	13H05-N05	3
Fargon/Phoenix	Lidocaine	13H05-N05	3
Fagron	Lidocaine	13H05-N050115/280	1
Fagron	Lidocaine	13J30-B02	6
Fagron	Lidocaine	13H05-N050171/245	1
Fagron	Lidocaine	13j30-B02-287639	1
Fagron	Lidocaine	13J30-B02-287640	1
Fagron	Lidocaine	13J30-b02-287639	1
PHOENIX 22.08.2014	Lidocaine	13J30-B02-287640	1
Fagron	Lidocaine	13J30-B02-287641	6
Fagron	Lidocaine	13J30-B02-292219	3
GEHE 02.12.2014	Lidocaine	13J30-B02-292220	1
Fagron	Lidocaine	13j30B02292219	1
Fagron	Lidocaine	13J30-B02-292220	2
Fagron	Lidocaine	13J30-B02-292221	6
Caelo	Lidocaine	13J30-B02-292221	1
Caelo	Lidocaine	14299301	3
Caelo	Lidocaine	14299303	2
Fagron	Lidocaine	14E13-B05	3
Caelo	Lidocaine	14299305	2
Fagron	Lidocaine	14E13-B05-295549	3
Fagron	Lidocaine	14E13-B05-295550	4
Gehe Kassel	Lidocaine	14E13-B05-295550	1
Fagron	Lidocaine	14E13-B05-295552	3
Fargron	Lidocaine	14E13-B05-295552	1
Caelo	Lidocaine	1512002	1
Caelo	Lidocaine	1512003	1
Caelo	Lidocaine	15212001	2
Caelo	Lidocaine	15212002	5
Caelo	Lidocaine	15212003	3
Rondell Apotheke	Lidocaine	15332304	1
Caelo	Lidocaine	15332302	1
Caelo	Lidocaine	15332303	1
Moehs BCN S.L. / Noweda	Lidocaine	15332305	1

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Supplier	Substance	Batch	Spectra
Phoenix	Lidocaine	15332305	1
Caelo	Lidocaine	15332305	2
Caelo	Lidocaine	15332306	3
Caelo	Lidocaine	15332309	2
Caelo	Lidocaine	15332310	3
Caelo	Lidocaine	15332314	3
Caesar&Loretz,Phönix,06...	Lidocaine	15332314	1
Fagron	Lidocaine	15A15-B01	2
Fagron	Lidocaine	15A15-01-304282	1
Fagron	Lidocaine	15A15-B01-304282	4
Fagron	Lidocaine	15A15-B01-304283	2
Fagron	Lidocaine	15A15B01304284	1
Phönix Gotha	Lidocaine	15A15-B01-304284	1
Caelo	Lidocaine	15A15-B01-304284	2
Fagron	Lidocaine	15A15-B01-304284	6
Fagron	Lidocaine	15D23-B08312058	1
Fagron	Lidocaine	15D23-B08309882	1
Caelo	Lidocaine	15D23-B08	1
Fagro/Gehe	Lidocaine	15a15b01304284	1
Fagron	Lidocaine	15d23-b08-309882	1
Fagron	Lidocaine	15D23-B08	1
Fagron	Lidocaine	15D23B08311708	1
Fagron	Lidocaine	15D23-B08-309882	1
Fagron	Lidocaine	15D23-B08-312058	8
Fagron	Lidocaine	15d23-b08-312058	2
Fagron	Lidocaine	15H27-B07	2
Caelo	Lidocaine	15H27-B07-318310	1
Fagron	Lidocaine	15H27-B07-315483	2
Fagron	Lidocaine	15h27-b05-318310	1
Alliance	Lidocaine	15H27-B07-318310	1
Euro OTC	Lidocaine	1603027-01	2
Fagron	Lidocaine	15H27-B07-316784	1
Caelo	Lidocaine	16087702	1
Caelo	Lidocaine	16087703	1
Caelo	Lidocaine	16087704	5
Caelo	Lidocaine	16087707	6
Caelo	Lidocaine	16087708	1
Caesar & Loretz GmbH Hi...	Lidocaine	16087709	1
Caelo	Lidocaine	16087710	2
Caelo	Lidocaine	16087711	2
Caelo	Lidocaine	16087712	3
Caelo	Lidocaine	160877708	1
Caelo	Lidocaine	16289502	5
Caesar&Loretz GmbH	Lidocaine	16289502	1
Caelo	Lidocaine	16289504	2
Ebert-Jacobi	Lidocaine	16289504	1
Caelo	Lidocaine	16A28-B06-320059	1
Caelo	Lidocaine	16289508	1
Fagron	Lidocaine	16A28-B06	1
Fagron	Lidocaine	16A28-B06-320059	2
Fagron	Lidocaine	16A-28-B06-321297	1
Alte Apotheke	Lidocaine	16A28B06-321297	1
Fagron	Lidocaine	16F21-B06	3
Fagron	Lidocaine	16F21-B06-323669	4
Fagron	Lidocaine	16F21-B06-323670	7
Fagron	Lidocaine	16F21-B06-325934	2
Fagron	Lidocaine	16F21B06325934	1
Fagron	Lidocaine	16F21-B06-327232	1
Fagron	Lidocaine	16F21-B06-328421	1
Fagron	Lidocaine	16F21-B06-332253	1

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Supplier	Substance	Batch	Spectra
Caelo	Lidocaine	16F21-B06-328421	1
Fagron	Lidocaine	16F21-B06-332253	1
Caelo	Lidocaine	2811M-03584	1
Caelo	Lidocaine	17183108	3
Caelo	Lidocaine	17183105	1
Fagron	Lidocaine	312/1	1
Fagron	Lidocaine		2
PHOENIX 22.08.2014	Lidocaine		2
Noweda	Lidocaine	5308e-07003	1
Fagron	Lidocaine	5742	1
Fagron	Lidocaine	700412-0004	1
Gehe 09.07.2013	Lidocaine	8565948	1
Caelo	Lidocaine	8629595	1
Fagron	Lidocaine	1014I-07006	1
Caelo	Lidocaine	11K17-N03	1
Caelo	Lidocaine	12H16-N05	1
Gutenberg-Apotheke	Lidocaine	13J30-B02	1
Caelo	Lidocaine	16087709	1

- 76 783 spectra from 463 *Apo-Ident* customers from a total of 25 406 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Lidocaine* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Lidocaine* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	200	0	72 233
Type B	0	270	10	161 793
Type C	0	375	1	76 783

The substance/substance group *Lidocaine* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9928 %)	96.4286 % (> 95.3571 %)
Type C	100.0000 % (> 99.8849 %)	99.7340 % (> 98.9362 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

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Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20942	20942	0.00	44.24
21640	22984	6.09	45.24
21673	22984	19.06	43.49
22984	22984	0.00	40.89
23019	22984	3.20	38.35

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Lidocaine hydrochloride**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20093-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Lidocaine hydrochloride; Lidocaini hydrochloridum; Lidocainum hydrochloricum

Special notes

When selecting the *Lidocaine hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Lidocaine hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Lidocaine hydroc…	12135511	20882	40	AR-15-FG-008867-01
Euro OTC	Lidocaine hydroc…	1403025-02	21613	40	20140516
Euro OTC	Lidocaine hydroc…	1411010	21770	40	0000009260

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Lidocaine hydrochloride*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 280 spectra from 8 reference samples of the substance/substance group *Lidocaine hydrochloride*.

- These include spectra of independent samples from 6 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Lidocaine hydrochloride	1403025-02	21613†	20
Euro OTC	Lidocaine hydrochloride	1411010	21770†	20
Euro OTC	Lidocaine hydrochloride	1606024	22702	40
Caelo	Lidocaine hydrochloride	162222	22771	40
Caelo	Lidocaine hydrochloride	152995	22772	40
Euro OTC	Lidocaine hydrochloride	1612015	22980	40
Caelo	Lidocaine hydrochloride	172048	23687	40
Caelo	Lidocaine hydrochloride	172923	23807	40

- 161 793 spectra from a total of 3491 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B*

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 860 spectra from 284 *Apo-Ident* customers from 191 batches from the substance/substance group *Lidocaine hydrochloride*.

- These include spectra of independent samples from 185 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Euro OTC	Lidocaine hydrochloride	1202035-01	32
Fagron	Lidocaine hydrochloride	218I-01775	1
Euro OTC	Lidocaine hydrochloride	1108017-01	8
Caelo	Lidocaine hydrochloride	1010024-01	2
Euro OTC	Lidocaine hydrochloride	120203501	2
Euro OTC	Lidocaine hydrochloride	1202035-02	51
Fagron	Lidocaine hydrochloride	1202035-02	1
Euro OTC	Lidocaine hydrochloride	1202035-03	15
Euro OTC	Lidocaine hydrochloride	120203502	5
Konduskar/Phönix	Lidocaine hydrochloride	1202035-03	1
Caelo	Lidocaine hydrochloride	12021503	1
Caelo	Lidocaine hydrochloride	12176103	9
Caelo	Lidocaine hydrochloride	13118807	6
Caelo	Lidocaine hydrochloride	13118803	6
Caelo	Lidocaine hydrochloride	13118811	2
Caelo	Lidocaine hydrochloride	13118808	5
Caelo	Lidocaine hydrochloride	13118812	3
Fagron	Lidocaine hydrochloride	13218-B11	1
Caelo	Lidocaine hydrochloride	13343002	5
Caelo	Lidocaine hydrochloride		1
Caesar & Loretz GmbH	Lidocaine hydrochloride	13343002	1
Caelo	Lidocaine hydrochloride	13343001	2
Caelo	Lidocaine hydrochloride	13343003	5
Caelo	Lidocaine hydrochloride	13343004	7
Euro OTC	Lidocaine hydrochloride		3
Caelo	Lidocaine hydrochloride	13343007	14
Caelo	Lidocaine hydrochloride	13343008	3
Caelo	Lidocaine hydrochloride	13343011	3
Caelo	Lidocaine hydrochloride	13343012	16
Caelo	Lidocaine hydrochloride	13343014	5
Caelo	Lidocaine hydrochloride	13343015	3
Caelo	Lidocaine hydrochloride	13343016	2
Caelo	Lidocaine hydrochloride	13343017	5
Caesar u Loretz	Lidocaine hydrochloride	13343017	1
Caelo	Lidocaine hydrochloride	13343019	5
Fagron	Lidocaine hydrochloride	13F07-N06	9
Fagron	Lidocaine hydrochloride	13L18-B11	1
Fagron	Lidocaine hydrochloride	13L18-B11-286901	1
Euro OTC	Lidocaine hydrochloride	1401010-01	1
Euro OTC	Lidocaine hydrochloride	1403025-01	17
Anzag	Lidocaine hydrochloride	1403025-01	1
PHOENIX 17.06.2014	Lidocaine hydrochloride	1403025-01	1
Euro OTC	Lidocaine hydrochloride	140302501	3
Euro OTC	Lidocaine hydrochloride	1403025-02	16

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Supplier	Substance	Batch	Spectra
sana	Lidocaine hydrochloride	1403025-02	1
Caelo	Lidocaine hydrochloride	1403025-02	3
Euro OTC	Lidocaine hydrochloride	140302502	2
Euro OTC	Lidocaine hydrochloride	1403025-03	1
Euro OTC	Lidocaine hydrochloride	140415A	1
Euro OTC	Lidocaine hydrochloride	1411010-01	34
Anzag	Lidocaine hydrochloride	1411010-01	1
Euro OTC	Lidocaine hydrochloride	141101001	4
Caelo	Lidocaine hydrochloride	1411010-01	2
Gehe	Lidocaine hydrochloride	1411010-01	1
Euro OTC	Lidocaine hydrochloride	1411010-02	24
Euro OTC	Lidocaine hydrochloride	1411010-01Mg25g	1
Phönix Gotha	Lidocaine hydrochloride	1411010-02	1
Caelo	Lidocaine hydrochloride	1411010-02	1
Noweda	Lidocaine hydrochloride	141101002	1
Euro OTC	Lidocaine hydrochloride	141101002	2
Euro OTC	Lidocaine hydrochloride	141101-01	1
Euro/Phönix	Lidocaine hydrochloride	141101010-01	1
Euro OTC	Lidocaine hydrochloride	1411010-02Mg50g	1
Euro OTC	Lidocaine hydrochloride	14110101-01	1
Euro OTC	Lidocaine hydrochloride	1411010-2	1
Caelo	Lidocaine hydrochloride	14254001	3
Fagron	Lidocaine hydrochloride	14B12-B03	2
Fagron	Lidocaine hydrochloride	14B12-B03-292214	10
Anzag	Lidocaine hydrochloride	14B12-B03-292214	1
Alliance health	Lidocaine hydrochloride	14B12-B03-292214	1
Fagron	Lidocaine hydrochloride	14E13-B06-294975	5
Fagron	Lidocaine hydrochloride	14B12-B03-292218	1
Fagron	Lidocaine hydrochloride	14e13-b06-294975	1
Fagron	Lidocaine hydrochloride	14J07-B04-299433	3
Sanacorp	Lidocaine hydrochloride	14J07-B04-299434	2
Fagron	Lidocaine hydrochloride	14J07-B04-299434	2
Fagron	Lidocaine hydrochloride	14J20-B05	1
Caelo	Lidocaine hydrochloride	14J20-B05-303131	1
Caelo	Lidocaine hydrochloride	14J20-B05-303133	1
Fagron	Lidocaine hydrochloride	14J20-B05-303131	1
Fagron	Lidocaine hydrochloride	15/17-B01-316805	2
Fagron	Lidocaine hydrochloride	14J20-B05-303133	2
Fargon GmbH & Co.KG	Lidocaine hydrochloride	15/17-B01-316805	1
Mahendra Chem./Noweda	Lidocaine hydrochloride	1505023	1
Euro OTC	Lidocaine hydrochloride	1505023-01	57
Fagron	Lidocaine hydrochloride	1505023-01	2
Caelo	Lidocaine hydrochloride	1505023-01	6
Euro OTC	Lidocaine hydrochloride	150502301	1
Euro OTC	Lidocaine hydrochloride	1505023-02	14
Sanacorp	Lidocaine hydrochloride	150502302	1
Euro OTC	Lidocaine hydrochloride	1505023-03	10
Caelo	Lidocaine hydrochloride	1505023-02	1
Caelo	Lidocaine hydrochloride	1505023-03	2
phönix	Lidocaine hydrochloride	1505023-03	1
Caelo	Lidocaine hydrochloride	1517-B01-315828	1
Euro/Alliance Healthcare	Lidocaine hydrochloride	150523-01	1
Caelo	Lidocaine hydrochloride	1515I-01775	1
Caelo	Lidocaine hydrochloride	1521304	1
Caesar & Loretz GmbH	Lidocaine hydrochloride	15215201	1
Bombastus	Lidocaine hydrochloride	15215301	1
Caelo	Lidocaine hydrochloride	15215201	3
Caelo	Lidocaine hydrochloride	15215301	5
Caelo	Lidocaine hydrochloride	15215302	3
Caesar&Loretz GmbH /Anzag	Lidocaine hydrochloride	15215303	1

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Supplier	Substance	Batch	Spectra
Caelo	Lidocaine hydrochloride	15215303	2
Caelo	Lidocaine hydrochloride	15215304	3
Gehe	Lidocaine hydrochloride	15215304	1
Rondell Apotheke	Lidocaine hydrochloride	15215308	1
Caelo	Lidocaine hydrochloride	15215308	2
Sanacorp	Lidocaine hydrochloride	15215309	1
Caelo	Lidocaine hydrochloride	15215309	2
Caelo	Lidocaine hydrochloride	15215310	9
Caelo	Lidocaine hydrochloride	15215311	3
Fagron	Lidocaine hydrochloride	15215311	2
Caelo	Lidocaine hydrochloride	15215312	6
Caelo	Lidocaine hydrochloride	152951602714117	1
Sanacorp	Lidocaine hydrochloride	15215312	1
Caelo	Lidocaine hydrochloride	15299503	8
Caelo	Lidocaine hydrochloride	15299506	3
Caelo	Lidocaine hydrochloride	15299509	2
Fagron	Lidocaine hydrochloride	15299513	1
Caelo	Lidocaine hydrochloride	15299513	4
Caelo	Lidocaine hydrochloride	15299514	5
Caelo	Lidocaine hydrochloride	15299516	4
Fagron	Lidocaine hydrochloride	15I17-B01-315828	2
Caelo	Lidocaine hydrochloride	160113	1
Fagron	Lidocaine hydrochloride	15I17-B01-316805	2
Euro OTC	Lidocaine hydrochloride	1606021-01	1
Euro OTC	Lidocaine hydrochloride	160602401	1
Euro OTC	Lidocaine hydrochloride	1600024-02	1
Euro OTC	Lidocaine hydrochloride	1606024-01	30
Ensbona/ Sanacorp	Lidocaine hydrochloride	1606024-01	1
Swati / Noweda	Lidocaine hydrochloride	1606024-01	1
Alte Apotheke	Lidocaine hydrochloride	1606024-01	2
Caelo	Lidocaine hydrochloride	1606024-01	12
Euro OTC	Lidocaine hydrochloride	1606024-02	18
Caelo	Lidocaine hydrochloride	1606024-02	1
Gehe	Lidocaine hydrochloride	1606024-02	1
Caelo	Lidocaine hydrochloride	160602402	1
Euro OTC	Lidocaine hydrochloride	1606024-03	3
Caelo	Lidocaine hydrochloride	16101407	1
Euro OTC	Lidocaine hydrochloride	1612015-01	4
Klenk	Lidocaine hydrochloride	1612015-01	2
Euro OTC	Lidocaine hydrochloride	1612015-02	3
Caelo	Lidocaine hydrochloride	1612015-02	1
Caelo	Lidocaine hydrochloride	16222203	3
Caelo	Lidocaine hydrochloride	16222207	2
phönix	Lidocaine hydrochloride	16222207	2
Caelo	Lidocaine hydrochloride	16222202	1
Caelo	Lidocaine hydrochloride	16222208	2
Caelo	Lidocaine hydrochloride	16222214	2
Caelo	Lidocaine hydrochloride	168020-0003	1
Fagron	Lidocaine hydrochloride	16C09-B03	1
Fagron	Lidocaine hydrochloride	16J24-B15-329421	2
Fagron	Lidocaine hydrochloride	16C09-B03-322144	1
Fargon GmbH & Co.KG	Lidocaine hydrochloride	16C09-B03-322144	2
Fagron	Lidocaine hydrochloride	17A16-B07-333010	1
Caelo	Lidocaine hydrochloride	17204804	1
Caelo	Lidocaine hydrochloride	17204803	2
Caelo	Lidocaine hydrochloride	18041501	1
Euro OTC	Lidocaine hydrochloride	23081601	1
Caelo	Lidocaine hydrochloride	1912M-01775	1
Caelo	Lidocaine hydrochloride	26041401	1
Caelo	Lidocaine hydrochloride	24071401	1

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Supplier	Substance	Batch	Spectra
Caelo	Lidocaine hydrochloride	280501	1
Caelo	Lidocaine hydrochloride	29081503	1
Fagron	Lidocaine hydrochloride	4612Q-01775	1
Caelo	Lidocaine hydrochloride	5113E-01775	1
Moehs Catalana, S.L./Ph...	Lidocaine hydrochloride		1
ACM	Lidocaine hydrochloride	KNC0625J17	1
Frago/Noweda	Lidocaine hydrochloride	6108-05-0	1
ACM	Lidocaine hydrochloride	KNC1247J15	1
Swati/Noweda	Lidocaine hydrochloride	LDH/116007	1
Caelo	Lidocaine hydrochloride	2051301	1
Fagron	Lidocaine hydrochloride	9E08-N03	1
Caelo	Lidocaine hydrochloride	4111302	1
Euro OTC	Lidocaine hydrochloride	1004040-01	1
Fagron	Lidocaine hydrochloride	8F26-N07	1
Alliance Health 08.03.2...	Lidocaine hydrochloride	1010024-01	1
Caelo	Lidocaine hydrochloride	10320703	1
Caelo	Lidocaine hydrochloride	10320704	1
Noweda	Lidocaine hydrochloride	11/19-N06	1
Caelo	Lidocaine hydrochloride	10320707	1
Caelo	Lidocaine hydrochloride	10320717	1
Euro OTC	Lidocaine hydrochloride	1103034-01	2
Caelo	Lidocaine hydrochloride	10320719	1
Noweda	Lidocaine hydrochloride	1108017-01	1
Euro OTC	Lidocaine hydrochloride	1108017-02	9
Noweda	Lidocaine hydrochloride	1108017-02	1
EuRho/Phoenix	Lidocaine hydrochloride	1108017-02	1
Caelo	Lidocaine hydrochloride	11091203	1
Caelo	Lidocaine hydrochloride	11302902	2
Caelo	Lidocaine hydrochloride	113002905	1
Caelo	Lidocaine hydrochloride	11302904	1
Caelo	Lidocaine hydrochloride	11302905	1
Caelo	Lidocaine hydrochloride	11302906	3
Fagron	Lidocaine hydrochloride	11H18-N01	2
Fagron	Lidocaine hydrochloride	11L09-N09	2
Caelo	Lidocaine hydrochloride	12020302	1
Euro OTC	Lidocaine hydrochloride	1202034-01	2
Euro OTC	Lidocaine hydrochloride	1202035	1
Caelo	Lidocaine hydrochloride	1202035	1
Euro OTC	Lidocaine hydrochloride	1202035/02	1
Caelo	Lidocaine hydrochloride	120203501	1
Finze	Lidocaine hydrochloride	1202035-01	1
Sanacorp	Lidocaine hydrochloride	1202035-01	3
Gehe	Lidocaine hydrochloride	1202035-01	1
Caelo	Lidocaine hydrochloride	1202035-02	2
Gehe	Lidocaine hydrochloride	1202035-02	1
PHOENIX am 12.02.2014	Lidocaine hydrochloride	1202035-02	1
Phönix	Lidocaine hydrochloride	1202035-03	1
Caelo	Lidocaine hydrochloride	1202035-03	1
Anzag	Lidocaine hydrochloride	1202035-03	1
Noweda	Lidocaine hydrochloride	1202035-03	1
Euro OTC	Lidocaine hydrochloride	1202035-1	1
Caelo	Lidocaine hydrochloride	12135503	6
Caelo	Lidocaine hydrochloride	12135504	3
Caelo	Lidocaine hydrochloride	12135508	7
Caelo	Lidocaine hydrochloride	12135509	4
Großhandel	Lidocaine hydrochloride	12135511	1
Fiebig 04.7.13 EK 4,54	Lidocaine hydrochloride	12135511	1
Caelo	Lidocaine hydrochloride	12135511	4
Caelo	Lidocaine hydrochloride	12176101	8
Caelo	Lidocaine hydrochloride	12176102	10

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Supplier	Substance	Batch	Spectra
Caelo	Lidocaine hydrochloride	12176109	2
Gehe	Lidocaine hydrochloride	12C05-N02	2
Fagron	Lidocaine hydrochloride	12c05-N02	1
Fagron	Lidocaine hydrochloride	12C05-N02	2
Fagron	Lidocaine hydrochloride	12E14-N04	3
Fagron	Lidocaine hydrochloride	12H09-N08	3
Caelo	Lidocaine hydrochloride	13118802	2
Caesar&Loretz GmbH/Anzag	Lidocaine hydrochloride	13118803	2
Caelo	Lidocaine hydrochloride	13118806	1
Caerlo	Lidocaine hydrochloride	13118807	1
Sanacorp	Lidocaine hydrochloride	13118807	1
Hedinger/Ebert	Lidocaine hydrochloride	13118807	1
Caolo	Lidocaine hydrochloride	13343008	1
Fagron	Lidocaine hydrochloride	13F07N06	1
Europ Ots Pharma	Lidocaine hydrochloride	1403025-01	1
EuRho	Lidocaine hydrochloride	140302501	1
Fagron	Lidocaine hydrochloride	14e13-b06-294973	1
Euro OTC	Lidocaine hydrochloride	20131010-4	1
Euro OTC	Lidocaine hydrochloride	2213U01775	1
Caelo	Lidocaine hydrochloride	23011403	1
Caelo	Lidocaine hydrochloride	25091202	1
Euro OTC	Lidocaine hydrochloride	2805016-01	1
Euro OTC	Lidocaine hydrochloride	2911029-01	1
Euro OTC	Lidocaine hydrochloride	2810029-01	1
Caelo	Lidocaine hydrochloride	5211E-01775	1
Caelo	Lidocaine hydrochloride	72702128	1
Fagron	Lidocaine hydrochloride	9B3M1L2Fo118	1
Caelo	Lidocaine hydrochloride	AKD14	1
Euro OTC	Lidocaine hydrochloride	LID-20-11-001	2
Fagron	Lidocaine hydrochloride	13L18-B11-286903	1
Caelo	Lidocaine hydrochloride	14110101	1
Caelo	Lidocaine hydrochloride	1606024	1
01.07.14	Lidocaine hydrochloride	13343004	1
Caelo	Lidocaine hydrochloride	1814U-01775	1
Caelo	Lidocaine hydrochloride	P155/14	1
A.H.D.	Lidocaine hydrochloride	1202035-02	1
Großhandel	Lidocaine hydrochloride	13343002	1
Caelo	Lidocaine hydrochloride	26071303	1

- 76 299 spectra from 462 *Apo-Ident* customers from a total of 25 360 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Lidocaine hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Lidocaine hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	280	0	161 793
Type C	0	824	36	76 299

The substance/substance group *Lidocaine hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 97.8571 %)
Type C	100.0000 % (> 99.8849 %)	95.8140 % (> 95.4651 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20882	20882	0.00	44.68
21613	20882	7.17	43.23
21770	21770	0.00	46.94

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**L-isoleucine**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	21045-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

L-isoleucine; L-Isoleucinum

Special notes

When selecting the L-*isoleucine* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group L-*isoleucine*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	L-isoleucine	13E02-B01-286930	21045	40	1403154
Fagron	L-isoleucine	13E02-B01	21332	40	20130621
Euro OTC	L-isoleucine	1604057	22566	40	20160601*
Euro OTC	L-isoleucine	1704022	23386	40	20170612*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 4 reference samples from the substance/substance group L-*isoleucine*. These samples are listed above in the section *calibration samples*. The reference samples originate from 4 different batches.

- 72 273 spectra from a total of 1578 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 320 spectra from 7 reference samples of the substance/substance group L-*isoleucine*.

- These include spectra of independent samples from 6 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	L-isoleucine	11F30-N06	20417	40
Euro OTC	L-isoleucine	L1211010-02	21535	60
Euro OTC	L-isoleucine	L1211010-02	21581	60
Euro OTC	L-isoleucine	1611007	22869	40
Euro OTC	L-isoleucine	1708027	23702	40
Euro OTC	L-isoleucine	1711034	23869	40
Euro OTC	L-isoleucine	1803019	24080	40

- 161 753 spectra from a total of 3493 batches from further 863 substances. These spectra were

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 9 spectra from 6 *Apo-Ident* customers from 9 batches from the substance/substance group L-*isoleucine*.

- These include spectra of independent samples from 8 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	L-isoleucine	12H30-N03	1
Fagron	L-isoleucine	13E02-B01-286930	1
Fagron	L-isoleucine	13E02-B01-291112	1
Fagron	L-isoleucine	15A14-B09	1
Fagron	L-isoleucine	11C31-N07	1
Fagron	L-isoleucine	12080167	1
Fagron	L-isoleucine	13A22-N03	1
Fagron	L-isoleucine	121101	1
Fagron	L-isoleucine	8166210302	1

- 77 150 spectra from 463 *Apo-Ident* customers from a total of 25 538 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group L-*isoleucine* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with L-*isoleucine* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	72 273
Type B	0	283	37	161 753
Type C	0	9	0	77 150

The substance/substance group L-*isoleucine* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9928 %)	88.4375 % (> 87.5000 %)
Type C	100.0000 % (> 99.8851 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21045	21045	0.00	37.80
21332	21045	4.71	36.31
22566	22566	0.00	37.51
23386	23386	0.00	33.20

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Lithium orotate monohydrate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	21055-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Lithium orotate monohydrate; Lithii orotas monohydricim

Special notes

When selecting the *Lithium orotate monohydrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Lithium orotate monohydrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Lithium orotate ...	13J04-N01	21055	40	1405616
Fagron	Lithium orotate ...	13I09-B04-290311	21688	40	20130927
Fagron	Lithium orotate ...	15F25-B01-315219	22502	40	20150716

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Lithium orotate monohydrate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 100 spectra from 3 reference samples of the substance/substance group *Lithium orotate monohydrate*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Lithium orotate monohydrate	10F25-N01	20437	40
Fagron	Lithium orotate monohydrate	13I09-B04-290311	21688†	20
Fagron	Lithium orotate monohydrate	16D15-B08-321402	23269	40

- 161 973 spectra from a total of 3496 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 7 spectra from 2 *Apo-Ident* customers from 3 batches from the substance/substance group *Lithium orotate monohydrate*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Pharmorgana	Lithium orotate monohydrate	ORL00212	4
Pfannenschmidt	Lithium orotate monohydrate	ORL00212	1
Fagron	Lithium orotate monohydrate	13J04-N01	1
Microsin	Lithium orotate monohydrate	ORL00315	1

- 77 152 spectra from 463 *Apo-Ident* customers from a total of 25 544 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Lithium orotate monohydrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Lithium orotate monohydrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	100	0	161 973
Type C	0	7	0	77 152

The substance/substance group *Lithium orotate monohydrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 94.0000 %)
Type C	100.0000 % (> 99.8851 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21055	21055	0.00	79.41
21688	21055	4.05	79.17
22502	21055	14.76	80.22

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**L-leucine**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20970-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

L-leucine; Leucinum

Special notes

When selecting the L-*leucine* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group L-*leucine*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	L-leucine	13J09-N03	20970	40	1402431
Euro OTC	L-leucine	1302013-01	21612	40	20130320
Euro OTC	L-leucine	1601032	22380	40	20160308*
Fagron	L-leucine	15D09-B06-322249	23199	40	20151030

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 4 reference samples from the substance/substance group L-*leucine*. These samples are listed above in the section *calibration samples*. The reference samples originate from 4 different batches.

- 72 273 spectra from a total of 1578 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 100 spectra from 3 reference samples of the substance/substance group L-*leucine*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	L-leucine	09D27-N04	20443	40
Euro OTC	L-leucine	1302013-01	21612†	20
Euro OTC	L-leucine	1708010	23607	40

- 161 973 spectra from a total of 3496 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B*

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 5 spectra from 3 *Apo-Ident* customers from 4 batches from the substance/substance group L-*leucine*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Euro OTC	L-leucine	L1208003-01	1
Euro OTC	L-leucine	1312032-01	2
Fargon	L-leucine	8160410903	1
Fagron	L-leucine	13J09-N03	1

- 77 154 spectra from 463 *Apo-Ident* customers from a total of 25 543 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group L-*leucine* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with L-*leucine* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	72 273
Type B	0	82	18	161 973
Type C	0	4	1	77 154

The substance/substance group L-*leucine* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9928 %)	82.0000 % (> 79.0000 %)
Type C	100.0000 % (> 99.8852 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to

exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20970	20970	0.00	67.00
21612	20970	9.49	67.61
22380	22380	0.00	60.24
23199	22380	15.04	53.42

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**L-malic acid**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	22357-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

L-malic acid; Acidum-(L)-malicum

Special notes

When selecting the L-*malic acid* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group L-*malic acid*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	L-malic acid	15J09-B03-313987	22357	40	9346
Fagron	L-malic acid	15J09-B03-313987	22730	40	20151106
Fagron	L-malic acid	16J06-B98-327269	23107	40	20161117

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group L-*malic acid*. These samples are listed above in the section *calibration samples*. The reference samples originate from 2 different batches.

- 72 313 spectra from a total of 1580 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 140 spectra from 4 reference samples of the substance/substance group L-*malic acid*.

- These include spectra of independent samples from 1 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	L-malic acid	15J09-B03-313987	22357†	20
Fagron	L-malic acid	15J09-B03-313987	22612	40
Fagron	L-malic acid	16J06-B98-327269	23222	40
Fagron	L-malic acid	17E23-B03-335458	23762	40

- 161 933 spectra from a total of 3496 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 0 spectra from 0 *Apo-Ident* customers from 0 batches from the substance/substance group L-*malic acid*.

- These include spectra of independent samples from 0 batches, of which no spectra have been used for the generation of the database.

- 77 159 spectra from 463 *Apo-Ident* customers from a total of 25 547 batches from a further 701 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group L-*malic acid* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with L-*malic acid* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	140	0	161 933
Type C	0	0	0	77 159

The substance/substance group L-*malic acid* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 95.7143 %)
Type C	100.0000 % (> 99.8849 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
22357	22357	0.00	91.11
22730	22357	3.93	89.12
23107	22357	1.88	90.58

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**L-phenylalanine**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	21661-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

L-phenylalanine; Phenylalaninum

Special notes

When selecting the L-*phenylalanine* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group L-*phenylalanine*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	L-phenylalanine	14088304	21661	40	1501656
Euro OTC	L-phenylalanine	1212014-03	21681	40	20130111
Euro OTC	L-phenylalanine	1704003	23173	40	20170425*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group L-*phenylalanine*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 132 spectra from 5 reference samples of the substance/substance group L-*phenylalanine*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	L-phenylalanine	14088304	21661†	20
Euro OTC	L-phenylalanine	1212014-03	21681†	20
Euro OTC	L-phenylalanine	1409013-02	23024	40
Fagron	L-phenylalanine	17B13-B03-343288	23936	40
Euro OTC	L-phenylalanine	1409013-02	not required	12

- 161 941 spectra from a total of 3495 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B*

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 0 spectra from 0 *Apo-Ident* customers from 0 batches from the substance/substance group L-*phenylalanine*.

- These include spectra of independent samples from 0 batches, of which no spectra have been used for the generation of the database.

- 77 159 spectra from 463 *Apo-Ident* customers from a total of 25 547 batches from a further 701 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group L-*phenylalanine* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with L-*phenylalanine* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	132	0	161 941
Type C	0	0	0	77 159

The substance/substance group L-*phenylalanine* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 95.4545 %)
Type C	100.0000 % (> 99.8849 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21661	21661	0.00	37.78
21681	23173	10.16	48.02
23173	23173	0.00	56.84

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**L-proline**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	21034-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

L-proline; Prolinum

Special notes

When selecting the L-*proline* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group L-*proline*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	L-proline	15D13-B02-308152	22270	40	1704059
Euro OTC	L-proline	1606010	22677	40	20160714*
Fagron	L-proline	16J14-B01-327195	23109	40	20161116
Euro OTC	L-proline	1705021	23546	40	20170720*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 4 reference samples from the substance/substance group L-*proline*. These samples are listed above in the section *calibration samples*. The reference samples originate from 4 different batches.

- 72 273 spectra from a total of 1578 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 320 spectra from 8 reference samples of the substance/substance group L-*proline*.

- These include spectra of independent samples from 5 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Dr. Behr	L-proline	P-07014859	20368	40
Euro OTC	L-proline	L1210046-02	21034	40
Euro OTC	L-proline	L1210046-02	21075	60
Euro OTC	L-proline	L1210046-01	21103	40
Fagron	L-proline	15D13-B02-308152	22270†	20
Euro OTC	L-proline	1606010-01	23013	40
Euro OTC	L-proline	1606010-01	23100	40
Euro OTC	L-proline	1801047	23961	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 753 spectra from a total of 3493 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 4 spectra from 2 *Apo-Ident* customers from 3 batches from the substance/substance group L-*proline*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Euro OTC	L-proline	1312029-01	1
Euro OTC	L-proline	L1210046-03	2
Euro OTC	L-proline	L1210045-01	1

- 77 155 spectra from 463 *Apo-Ident* customers from a total of 25 544 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group L-*proline* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with L-*proline* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	72 273
Type B	0	239	81	161 753
Type C	0	4	0	77 155

The substance/substance group L-*proline* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9928 %)	74.6875 % (> 73.7500 %)
Type C	100.0000 % (> 99.8853 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several

new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
22270	22270	0.00	65.47
22677	22677	0.00	73.43
23109	22270	3.41	67.82
23546	23546	0.00	45.47

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**L-serine**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	22289-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

L-serine; Serinum

Special notes

When selecting the L-*serine* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group L-*serine*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	L-serine	1512012	22289	40	20160112*
Euro OTC	L-serine	1606020-01	22668	40	20160714
Euro OTC	L-serine	1711033	23914	40	20171208*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group L-*serine*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 100 spectra from 3 reference samples of the substance/substance group L-*serine*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	L-serine	1512012	22289†	20
Euro OTC	L-serine	1606020	22678	40
Euro OTC	L-serine	1611006	22922	40

- 161 973 spectra from a total of 3496 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 3 spectra from 1 *Apo-Ident* customers from 1 batches from the substance/substance group L-*serine*.

- These include spectra of independent samples from 0 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Euro OTC	L-serine	1606020-01	3

- 77 156 spectra from 463 *Apo-Ident* customers from a total of 25 546 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group L-*serine* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with L-*serine* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	100	0	161 973
Type C	0	3	0	77 156

The substance/substance group L-*serine* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 94.0000 %)
Type C	100.0000 % (> 99.8854 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
22289	22289	0.00	69.93
22668	22289	5.70	61.45
23914	23914	0.00	66.53

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**L-threonine**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20734-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

L-threonine; Threoninum

Special notes

When selecting the L-*threonine* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group L-*threonine*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	L-threonine	12H02-N03	20734	40	1402580
Euro OTC	L-threonine	1210027-01	21033	40	1403152
Euro OTC	L-threonine	1601031	22378	40	20160225*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group L-*threonine*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 260 spectra from 6 reference samples of the substance/substance group L-*threonine*.

- These include spectra of independent samples from 5 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Pharmorgana	L-threonine	1000110839	20410	40
Euro OTC	L-threonine	1210027-01	22319	60
Euro OTC	L-threonine	1606019	22679	40
Euro OTC	L-threonine	1609014	22792	40
Euro OTC	L-threonine	1703035	23158	40
Euro OTC	L-threonine	1711010	23738	40

- 161 813 spectra from a total of 3493 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 7 spectra from 2 *Apo-Ident* customers from 5 batches from the substance/substance group L-*threonine*.

- These include spectra of independent samples from 4 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Euro OTC	L-threonine	1210027-02	2
Pharmorgana	L-threonine	100110839	1
Euro OTC	L-threonine	1210027-01	2
Euro OTC	L-threonine	1111015-01	1
Fargon	L-threonine	2114720407	1

- 77 152 spectra from 463 *Apo-Ident* customers from a total of 25 542 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group L-*threonine* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with L-*threonine* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	260	0	161 813
Type C	0	7	0	77 152

The substance/substance group L-*threonine* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 97.6923 %)
Type C	100.0000 % (> 99.8851 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20734	20734	0.00	67.53
21033	21033	0.00	65.23
22378	22378	0.00	69.72

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**L-tryotophan**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20336-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

L-tryotophan; Tryptophanum

Special notes

When selecting the L-*tryotophan* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group L-*tryotophan*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	L-tryotophan	14B05-B32-293485	21784	40	AR-15-FG-009473-01
Euro OTC	L-tryotophan	1506003	21866	40	20150630*
Euro OTC	L-tryotophan	1506003	21871	40	20150630*
Euro OTC	L-tryotophan	1712006	23876	40	20180105*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 4 reference samples from the substance/substance group L-*tryotophan*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 273 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 260 spectra from 8 reference samples of the substance/substance group L-*tryotophan*.

- These include spectra of independent samples from 5 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	L-tryotophan	11G25-N02	20336	40
Fagron	L-tryotophan	09L28-N03	20369	40
Fagron	L-tryotophan	10I28-806	20387	40
Fagron	L-tryotophan	14B05-B32-293485	21784†	20
Euro OTC	L-tryotophan	1506003	21866†	20
Euro OTC	L-tryotophan	1506003	21871†	20
Fagron	L-tryotophan	16E11-B03-322919	23195	40
Fagron	L-tryotophan	17G19-B01-343931	23998	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 813 spectra from a total of 3492 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 23 spectra from 7 *Apo-Ident* customers from 12 batches from the substance/substance group L-*tryotophan*.

- These include spectra of independent samples from 12 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Pharmorgana	L-tryotophan	1000140147	1
Fagron	L-tryotophan	13J10-N03	2
Fagron	L-tryotophan	11D15-N04	1
Fagron	L-tryotophan	11G25-N02	3
Caelo	L-tryotophan	131046	1
Fagron	L-tryotophan	Ch12K02-N05	1
Euro OTC	L-tryotophan	1111044-01	1
Euro OTC	L-tryotophan	1212010-01	1
euroct/gehe	L-tryotophan	1212010-01	5
Euro OTC	L-tryotophan	1302021-01	1
Euro OTC	L-tryotophan	1307004-01	3
Fagron	L-tryotophan	1404027-01	2
Fagron	L-tryotophan	12B14-N15	1

- 77 136 spectra from 463 *Apo-Ident* customers from a total of 25 535 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group L-*tryotophan* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with L-*tryotophan* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	72 273
Type B	0	260	0	161 813
Type C	0	23	0	77 136

The substance/substance group L-*tryotophan* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 97.6923 %)
Type C	100.0000 % (> 99.8850 %)	100.0000 % (> 73.9130 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21784	21784	0.00	57.61
21866	21866	0.00	56.72
21871	21871	0.00	56.95
23876	23876	0.00	56.33

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Lysine hydrochloride**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20385-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Lysine hydrochloride; Lysine HCl; Lysini hydrochloridum; Lysini hydrochloridum Inf

Special notes

When selecting the *Lysine hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Lysine hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Lysine hydrochlo…	15B09-B06-304170	21963	40	20150220
Fagron	Lysine hydrochlo…	14H20-B03-301894	21983	40	AR-16-FG-005856-01
Euro OTC	Lysine hydrochlo…	1708009	23698	40	20170922*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Lysine hydrochloride*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 240 spectra from 7 reference samples of the substance/substance group *Lysine hydrochloride*.

- These include spectra of independent samples from 5 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Lysine hydrochloride	L1103041-01	20385	40
Dr. Behr	Lysine hydrochloride	P-07014932	20402	40
Fagron	Lysine hydrochloride	12B14-N08	20735	40
Fagron	Lysine hydrochloride	15B09-B06-304170	21963†	20
Fagron	Lysine hydrochloride	14H20-B03-301894	21983†	20
Euro OTC	Lysine hydrochloride	1603011	22527	40
Euro OTC	Lysine hydrochloride	1611021	22865	40

- 161 833 spectra from a total of 3492 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 10 spectra from 4 *Apo-Ident* customers from 5 batches from the substance/substance group *Lysine hydrochloride*.

- These include spectra of independent samples from 4 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Euro OTC	Lysine hydrochloride	L1209002-1	1
Euro OTC	Lysine hydrochloride	L1205030-01	1
Euro OTC	Lysine hydrochloride	L1304015-01	5
Fagron	Lysine hydrochloride	14H20-B03-301894	1
Fagron	Lysine hydrochloride	2167210405	1
AHD	Lysine hydrochloride	L1304015-01	1

- 77 149 spectra from 463 *Apo-Ident* customers from a total of 25 542 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Lysine hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Lysine hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	120	120	161 833
Type C	0	9	1	77 149

The substance/substance group *Lysine hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	50.0000 % (> 48.7500 %)
Type C	100.0000 % (> 99.8851 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several

new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21963	21983	4.11	55.67
21983	21983	0.00	59.15
23698	23698	0.00	61.38

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Macrogols 1500**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20112-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Macrogols 1500; Macrogolum 1500; Polyaethylenglycolum 1500

Special notes

When selecting the *Macrogols 1500* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Macrogols 1500*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Macrogols 1500	12324607	20977	40	1403323
Euro OTC	Macrogols 1500	1508002	21948	40	20150810*
Euro OTC	Macrogols 1500	1604005	22544	40	20160512*
Caelo	Macrogols 1500	17120001	23241	40	20170519
Caelo	Macrogols 1500	171200	23291	40	20170519*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 200 spectra of 5 reference samples from the substance/substance group *Macrogols 1500*. These samples are listed above in the section *calibration samples*. The reference samples originate from 5 different batches.

- 72 233 spectra from a total of 1577 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 250 spectra from 6 reference samples of the substance/substance group *Macrogols 1500*.

- These include spectra of independent samples from 5 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Macrogols 1500	10037704	20112	70
Euro OTC	Macrogols 1500	1508002	21948†	20
Euro OTC	Macrogols 1500	1705004	23423	40
Euro OTC	Macrogols 1500	1705036	23440	40
Caelo	Macrogols 1500	172221	23625	40
Euro OTC	Macrogols 1500	1711032	23898	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 823 spectra from a total of 3493 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 42 spectra from 18 *Apo-Ident* customers from 20 batches from the substance/substance group *Macrogols 1500*.

- These include spectra of independent samples from 20 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Euro OTC	Macrogols 1500	1304023-01	7
Euro OTC	Macrogols 1500	1406004-01	2
Caelo	Macrogols 1500	13140902	2
Gehe	Macrogols 1500	14072409	1
Caelo	Macrogols 1500	14072412	1
Phönix	Macrogols 1500	14072402	1
Euro OTC	Macrogols 1500	1503026-01	4
Caelo	Macrogols 1500	15120007	1
Caelo	Macrogols 1500	15413111	1
Caelo	Macrogols 1500	10105901	1
Caelo	Macrogols 1500	10105905	1
Caelo	Macrogols 1500	11056504	1
Caelo	Macrogols 1500	11071309	1
Euro OTC	Macrogols 1500	1206005-01	7
Caelo	Macrogols 1500	12109409	2
Anzag 21.06.2013	Macrogols 1500	12324610	1
Caelo	Macrogols 1500	13140901	1
Euro OTC	Macrogols 1500	1103017-02	4
ACM / Herba	Macrogols 1500	KN-0826/10	1
Caelo	Macrogols 1500	13140906	2

- 77 117 spectra from 463 *Apo-Ident* customers from a total of 25 527 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Macrogols 1500* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Macrogols 1500* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	200	0	72 233
Type B	0	223	27	161 823
Type C	0	40	2	77 117

The substance/substance group *Macrogols 1500* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9928 %)	89.2000 % (> 88.0000 %)
Type C	100.0000 % (> 99.8850 %)	95.2381 % (> 88.0952 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20977	20977	0.00	28.64
21948	21948	0.00	47.19
22544	22544	0.00	42.63
23241	23291	6.18	30.42
23291	23291	0.00	31.89

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Macrogols 4000**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20690-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Macrogols 4000; Macrogolum 4000; Polyaethylenglycolum 4000

Special notes

When selecting the *Macrogols 4000* substance/substance group, the following information is displayed to the user:

- Advice for the distinction from Macrogol 6000: Macrogol 4000 cannot be certainly distinct from Macrogol 6000, which is however currently not deliverable in Germany. Please decide, if an additional analysis seems reasonable.

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Macrogols 4000*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Macrogols 4000	12074116	20690	40	1401164
Caelo	Macrogols 4000	12318019	20975	40	1403322
Caelo	Macrogols 4000	12361502	21065	40	20130107

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Macrogols 4000	13356616	21357	40	20131107
Euro OTC	Macrogols 4000	1507004	21841	40	0000010550
Fagron	Macrogols 4000	15B13-B04-305461	21886	40	AR-16-FG-004020-01
Euro OTC	Macrogols 4000	1508031	21903	40	20150914*
Euro OTC	Macrogols 4000	1605012	22567	40	20160606*
Euro OTC	Macrogols 4000	1605025	22570	40	20160603*
Fagron	Macrogols 4000	16F10-B04-325645	23021	40	20160822
Euro OTC	Macrogols 4000	1702003	23174	40	20170301*
Euro OTC	Macrogols 4000	1711016	23902	40	20171214*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 480 spectra of 12 reference samples from the substance/substance group *Macrogols 4000*. These samples are listed above in the section *calibration samples*. The reference samples originate from 12 different batches.

- 71 953 spectra from a total of 1570 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 630 spectra from 17 reference samples of the substance/substance group *Macrogols 4000*.

- These include spectra of independent samples from 14 batches, of which no spectra have been used for the generation of the database.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Macrogols 4000	10059103	20114	70
Fagron	Macrogols 4000	10L02-N05	20172	30
Fagron	Macrogols 4000	10H03-N03	20173	30
Caelo	Macrogols 4000	11172433	20692	40
Euro OTC	Macrogols 4000	1507004	21841†	20
Fagron	Macrogols 4000	15B13-B04-305461	21886†	20
Euro OTC	Macrogols 4000	1508031	21903†	20
Euro OTC	Macrogols 4000	1609018	22791	40
Euro OTC	Macrogols 4000	1701007	22983	40
Caelo	Macrogols 4000	170686	23280	40
Caelo	Macrogols 4000	171190	23282	40
Euro OTC	Macrogols 4000	1705019	23433	40
Euro OTC	Macrogols 4000	1707026	23537	40
Caelo	Macrogols 4000	172081	23657	40
Caelo	Macrogols 4000	173039	23825	40
Euro OTC	Macrogols 4000	1804001	24089	40
Euro OTC	Macrogols 4000	1803029	24094	40

- 161 443 spectra from a total of 3482 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 486 spectra from 138 *Apo-Ident* customers from 217 batches from the substance/substance group *Macrogols 4000*.

- These include spectra of independent samples from 212 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Macrogols 4000	2022015A	1
Fagron	Macrogols 4000	3032014B	1
Caelo	Macrogols 4000	39393137	1
Fagron	Macrogols 4000	8012015A	1
Fagron	Macrogols 4000	505201C	1
Fagron	Macrogols 4000	8062015C	1
Fagron	Macrogols 4000	914I-02103	1
Fagron	Macrogols 4000	8062015B	1
Fagron	Macrogols 4000	10022015A	1
Fagron	Macrogols 4000	10022015B	1
Euro OTC	Macrogols 4000	1005011-01	1
Henry Lamotte	Macrogols 4000	1213test	1
Caelo	Macrogols 4000	1180513	1
Caelo	Macrogols 4000	123Test	1
Caelo	Macrogols 4000	1234	1

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†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Supplier	Substance	Batch	Spectra
Fagron	Macrogols 4000	123Test	1
Euro OTC	Macrogols 4000	1305020-02	3
Euro OTC	Macrogols 4000	130502002	1
Caelo	Macrogols 4000	13081501	1
Caelo	Macrogols 4000	13136011	4
Caelo	Macrogols 4000	13136016	2
Caelo	Macrogols 4000	13335102	2
GEHE 06.05.2014	Macrogols 4000	13356608	2
Caelo	Macrogols 4000	13335107	1
Caelo	Macrogols 4000	13356601	5
Caelo	Macrogols 4000	13335120	1
Fagron	Macrogols 4000	13356608	1
Caelo	Macrogols 4000	13356609	4
Caelo	Macrogols 4000	13356611	4
ANZAG 15.05.2014	Macrogols 4000	13356616	1
Caelo	Macrogols 4000	13356616	2
Caelo	Macrogols 4000	13356617	8
Caelo	Macrogols 4000	13356621	1
Fagron	Macrogols 4000	13G19-N08	3
Fagron	Macrogols 4000	13I17-N03	1
Caelo	Macrogols 4000	1401708	1
Caelo	Macrogols 4000	14061705	10
Caelo	Macrogols 4000	14061707	6
Caelo	Macrogols 4000	14061708	13
Fagron	Macrogols 4000	14061710	1
Caelo	Macrogols 4000	14061713	1
Caelo	Macrogols 4000	14061712	1
Euro OTC	Macrogols 4000	140701001	1
Caelo	Macrogols 4000	14180503	1
Caelo	Macrogols 4000	14180504	1
Caelo	Macrogols 4000	14180508	2
Caelo	Macrogols 4000	14180511	4
Caelo	Macrogols 4000	14180512	1
Caelo	Macrogols 4000	14180513	1
Caelo	Macrogols 4000	14180520	3
Caesar & Loretz GmbH	Macrogols 4000	14180520	1
Caelo	Macrogols 4000	14180522	1
Caelo	Macrogols 4000	14180524	1
Caelo	Macrogols 4000	14180525	5
Caelo	Macrogols 4000	1418521	1
Caelo	Macrogols 4000	14196013	1
Caesar&Loretz GmbH/Anzag	Macrogols 4000	14196017	1
Gatt-Koller	Macrogols 4000	1420/04152915	1
Gatt-Koller	Macrogols 4000	1420/04153415	1
Caelo	Macrogols 4000	14352606	4
Caelo	Macrogols 4000	14352607	3
Caelo	Macrogols 4000	14352608	1
Fagron	Macrogols 4000	14352612	2
Caelo	Macrogols 4000	14352613	5
Caelo	Macrogols 4000	14352611	2
Caelo	Macrogols 4000	14352612	1
Caelo	Macrogols 4000	14352614	1
Caelo	Macrogols 4000	14352618	2
Fagron	Macrogols 4000	14A03-B01-289602	3
Fagron	Macrogols 4000	14A03B01	1
Fagron	Macrogols 4000	14A03-B01	1
Fagron	Macrogols 4000	14A03-B01-289603	1
Fagron	Macrogols 4000	14A03-B01-289605	3
Fagron	Macrogols 4000	14B28-B03	1
Fagron	Macrogols 4000	14D14-B06	1

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Supplier	Substance	Batch	Spectra
Fagron	Macrogols 4000	14D14-B06-293453	3
Fagron	Macrogols 4000	14D14-B06-293454	1
Fagron	Macrogols 4000	14G15-B07-295632	1
Fagron	Macrogols 4000	14K03-b07-300522	1
Fagron	Macrogols 4000	14G15-B07-295634	1
Fagron	Macrogols 4000	14K03-B07-300522	2
Gehe	Macrogols 4000	14K03-B07-300522	1
Fagron	Macrogols 4000	14L12-B06-301991	1
Fagron	Macrogols 4000	15/29-B01-318038	2
phönix	Macrogols 4000	1502031-02	1
Euro OTC	Macrogols 4000	1507004-01	1
Euro OTC	Macrogols 4000	1508031-01	1
Euro OTC	Macrogols 4000	1508031-02	1
Caelo	Macrogols 4000	1508031-02	1
Caelo	Macrogols 4000	15159502	1
Fagron	Macrogols 4000	15092014A	1
Caelo	Macrogols 4000	15159504	2
Caelo	Macrogols 4000	15159505	2
Caelo	Macrogols 4000	15159514	4
Caelo	Macrogols 4000	15159506	1
Caelo	Macrogols 4000	15159515	4
Euro OTC	Macrogols 4000	15159515	1
Caelo	Macrogols 4000	15225001	1
Caelo	Macrogols 4000	15159516	2
Caelo	Macrogols 4000	15225003	5
Caelo	Macrogols 4000	15225013	1
Caelo	Macrogols 4000	15335001	8
Caelo	Macrogols 4000	15335003	11
Caelo	Macrogols 4000	15335007	4
Caelo	Macrogols 4000	1535004	1
phönix	Macrogols 4000	1535007	1
Caelo	Macrogols 4000	15376503	2
Caelo	Macrogols 4000	15406301	6
phönix	Macrogols 4000	15406302	1
Caelo	Macrogols 4000	15406302	2
Caelo	Macrogols 4000	15406306	1
Caelo	Macrogols 4000	15406303	4
Fagron	Macrogols 4000	15A08-B03	1
Fagron	Macrogols 4000	15A08-B03-302761	1
Fagron	Macrogols 4000	15A08-B03-302762	3
Fagron	Macrogols 4000	15A08B03302762	1
Fagron	Macrogols 4000	15B13-B04-305461	3
Fagron	Macrogols 4000	15H10-B04-314037	2
Fagron	Macrogols 4000	15H10-B04-31407	1
Fagron	Macrogols 4000	15I29-B01-318038	1
Caelo	Macrogols 4000	16023903	4
phönix	Macrogols 4000	16023904	1
Caelo	Macrogols 4000	16023904	2
Phoenix	Macrogols 4000	16023905	1
Cealo/Gehe	Macrogols 4000	16023907	1
Rondell Apotheke	Macrogols 4000	16023905	1
phönix	Macrogols 4000	1605012-01	1
Caelo	Macrogols 4000	16152001	9
Fagron	Macrogols 4000	160514a	1
Caelo	Macrogols 4000	16152003	4
Caelo	Macrogols 4000	16267305	6
Caelo	Macrogols 4000	16267307	7
Caelo	Macrogols 4000	16267311	2
Caelo	Macrogols 4000	16308902	6
Caelo	Macrogols 4000	16267308	3

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Supplier	Substance	Batch	Spectra
Caelo	Macrogols 4000	16308904	6
Caelo	Macrogols 4000	16308905	1
VDL	Macrogols 4000	16308906	1
Caelo	Macrogols 4000	16308907	4
Fagron	Macrogols 4000	16A20-B15-320060	1
Caelo	Macrogols 4000	16308908	1
Fagron	Macrogols 4000	16A20-B15-320652	6
Fagron	Macrogols 4000	16a20-b15-320652	8
phönix	Macrogols 4000	1701007-01	3
Phönix	Macrogols 4000	1707026-01	1
Caelo	Macrogols 4000	17035604	1
Caelo	Macrogols 4000	17035606	1
Caelo	Macrogols 4000	17208103	3
Caelo	Macrogols 4000	17303901	1
Fagron	Macrogols 4000	18082014C	1
Fagron	Macrogols 4000	20092014A	1
Fagron	Macrogols 4000	21052015A	1
Fagron	Macrogols 4000	22062015A	1
Fagron	Macrogols 4000	2215I-02103	1
Fagron	Macrogols 4000	22122014A	1
Fagron	Macrogols 4000	25082014A	1
Caelo	Macrogols 4000	23061505	1
Fagron	Macrogols 4000	26052014A	1
Gatt-Koller	Macrogols 4000	2792/07153315	1
Fagron	Macrogols 4000	28052014B	1
Fagron	Macrogols 4000	290714c	1
Fagron	Macrogols 4000	30092014B	1
Gatt-Koller	Macrogols 4000	4643/01170417	2
Caelo	Macrogols 4000	4123585	1
ACM	Macrogols 4000	KNC0366J15	2
Fagron	Macrogols 4000	2122013a	1
Fagron	Macrogols 4000	2122013b	1
Facron	Macrogols 4000	7022014C	1
Fagron	Macrogols 4000	1112M-02103	1
Euro OTC	Macrogols 4000	1010023-02	1
Caelo	Macrogols 4000	1010023-02	1
Caelo	Macrogols 4000		1
Caelo	Macrogols 4000	11172303	1
Phoenix 14.05.2012	Macrogols 4000	11H01-N04	1
Caelo	Macrogols 4000	1172404	1
Caelo	Macrogols 4000	11I05-N11	1
Euro OTC	Macrogols 4000	1202040-02	3
Caelo	Macrogols 4000	12074102	1
EuRho	Macrogols 4000	1206009-01	1
Caelo	Macrogols 4000	12074109	4
Caelo	Macrogols 4000	12074114	2
Caelo	Macrogols 4000	12074116	3
Caelo	Macrogols 4000	12149103	1
Caelo	Macrogols 4000	12149108	1
Caelo	Macrogols 4000	12149113	2
Caelo	Macrogols 4000	12149115	2
Gehe	Macrogols 4000	1219-N13	1
Caelo	Macrogols 4000	12318019	2
Caelo	Macrogols 4000	12318011	2
Noweda	Macrogols 4000	12361502	2
Caelo	Macrogols 4000	12318027	1
Phönix Gotha	Macrogols 4000	12361502	1
Caelo	Macrogols 4000	12361502	3
Caelo	Macrogols 4000	12361506	10
Caelo	Macrogols 4000	12361512	3

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Supplier	Substance	Batch	Spectra
Noweda	Macrogols 4000	12361512	1
Caelo	Macrogols 4000	12361513	3
Alliance Healthcare	Macrogols 4000	12361512	1
Caelo	Macrogols 4000	12361518	7
Fagron	Macrogols 4000	12A12-N07	2
Fagron	Macrogols 4000	12C29-N15	1
Fagron	Macrogols 4000	12F13-N01	2
Fagron	Macrogols 4000	12F29-N01	2
Fagron	Macrogols 4000	12I20-n03	1
Fagron	Macrogols 4000	12F29-NO1	1
Fagron	Macrogols 4000	12I20-N03	1
Fagron	Macrogols 4000	12L10-N06	3
Caelo	Macrogols 4000	13136001	4
DIV GH	Macrogols 4000	13/12	1
Caelo	Macrogols 4000	13136003	3
Noweda	Macrogols 4000	13136003	1
Caelo	Macrogols 4000	13136009	3
Caelo	Macrogols 4000	13136010	1
Bombastus	Macrogols 4000	13136016	1
Caelo	Macrogols 4000	1316003	1
Caelo	Macrogols 4000	13356602	4
Fagron	Macrogols 4000	13B20-N01	2
Fagron	Macrogols 4000	13B20N01	1
Sanacorp	Macrogols 4000	13B20-N01	1
Fagron	Macrogols 4000	13F12-N09	1
Fagron	Macrogols 4000	13F12N09	1
Hedinger	Macrogols 4000	13G19-NO8	1
Fagron	Macrogols 4000	16102013A	1
Sanacorp	Macrogols 4000	14061707	1
Fagron	Macrogols 4000	17012014A	1
Fagron	Macrogols 4000	20122013C	1
Fagron	Macrogols 4000	280913C	2
Fagron	Macrogols 4000	26082013A	1
Caelo	Macrogols 4000	IntCh217002	1
Caelo	Macrogols 4000	16023905	1
Fagron	Macrogols 4000	3114I-02103	1
Caelo	Macrogols 4000	11172308	1
Caelo	Macrogols 4000	11172319	1
Caelo	Macrogols 4000	3940608	1
Gutenberg-Apotheke	Macrogols 4000	13356609	1
Caelo	Macrogols 4000	14196007	1
Caelo	Macrogols 4000	14180526	1
Phoenix	Macrogols 4000	12258901	1
Fagron	Macrogols 4000	13136010	1
Caelo	Macrogols 4000	13335106	1
Ichthyol/Phönix	Macrogols 4000	13356602	3

- 76 673 spectra from 463 *Apo-Ident* customers from a total of 25 333 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Macrogols 4000* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all

relevant spectra of the various substances were compared with *Macrogols 4000* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	480	0	71 953
Type B	0	616	14	161 247
Type C	0	484	2	76 670

The substance/substance group *Macrogols 4000* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9887 %)	100.0000 % (> 98.7500 %)
Type B	100.0000 % (> 99.9928 %)	97.7778 % (> 97.3016 %)
Type C	100.0000 % (> 99.8854 %)	99.5885 % (> 98.9712 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20690	20690	0.00	44.00
20975	20975	0.00	43.70
21065	20690	6.29	42.50
21357	22567	6.30	40.23
21841	21841	0.00	37.66
21886	21886	0.00	43.16
21903	21903	0.00	53.41
22567	22567	0.00	36.64
22570	22570	0.00	47.71
23021	21886	4.95	44.34
23174	23174	0.00	56.22
23902	23902	0.00	55.40

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Magnesium citrate, anhydrous**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20616-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Magnesium citrate, anhydrous; Magnesii citras anhydricus; Magnesii citricum siccatum

Special notes

When selecting the *Magnesium citrate, anhydrous* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Magnesium citrate, anhydrous*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Magnesium citrat…	1501031	21794	40	AR-15-FG-007845-01
Euro OTC	Magnesium citrat…	1506020	21829	40	0000010379
Euro OTC	Magnesium citrat…	1507019	21860	40	0000010617
Euro OTC	Magnesium citrat…	1511018	22225	40	20151130*
Euro OTC	Magnesium citrat…	1602028	22505	40	20160314*
Euro OTC	Magnesium citrat…	1706007	23549	40	20170720*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 240 spectra of 6 reference samples from the substance/substance group *Magnesium citrate, anhydrous*. These samples are listed above in the section *calibration samples*. The reference samples originate from 6 different batches.

- 72 193 spectra from a total of 1576 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 280 spectra from 9 reference samples of the substance/substance group *Magnesium citrate, anhydrous*.

- These include spectra of independent samples from 5 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Dr. Paul Lohmann	Magnesium citrate, anhydrous	1040331	20616	40
Euro OTC	Magnesium citrate, anhydrous	1501031	21794†	20
Euro OTC	Magnesium citrate, anhydrous	1506020	21829†	20
Euro OTC	Magnesium citrate, anhydrous	1507019	21860†	20
Euro OTC	Magnesium citrate, anhydrous	1511018	22225†	20
Euro OTC	Magnesium citrate, anhydrous	1607006	22673	40
Euro OTC	Magnesium citrate, anhydrous	1701018	22998	40
Euro OTC	Magnesium citrate, anhydrous	1711018	23895	40
Euro OTC	Magnesium citrate, anhydrous	1803033	24088	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 793 spectra from a total of 3490 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 1 spectra from 1 *Apo-Ident* customers from 1 batches from the substance/substance group *Magnesium citrate, anhydrous*.

- These include spectra of independent samples from 1 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Euro OTC	Magnesium citrate, anhydrous	1602028-01	1

- 77 158 spectra from 463 *Apo-Ident* customers from a total of 25 546 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Magnesium citrate, anhydrous* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Magnesium citrate, anhydrous* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	240	0	72 193
Type B	0	266	14	161 793
Type C	0	1	0	77 158

The substance/substance group *Magnesium citrate, anhydrous* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.5000 %)
Type B	100.0000 % (> 99.9928 %)	95.0000 % (> 93.9286 %)
Type C	100.0000 % (> 99.8862 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several

new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21794	21794	0.00	37.06
21829	21829	0.00	24.41
21860	21860	0.00	17.27
22225	22225	0.00	29.21
22505	22505	0.00	46.27
23549	23549	0.00	40.65

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Magnesium hydrogen aspartate tetrahydrate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20812-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Magnesium hydrogen aspartate tetrahydrate; Magnesii aspartas tetrahydricus; Magnesii asparticum tetrahydricum

Special notes

When selecting the *Magnesium hydrogen aspartate tetrahydrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Magnesium hydrogen aspartate tetrahydrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Magnesium hydrog…	1204014-01	20812	40	1404588
Euro OTC	Magnesium hydrog…	1306045-01	21749	40	20130708
Euro OTC	Magnesium hydrog…	1605031	22682	40	20160617*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Magnesium hydrogen aspartate tetrahydrate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 220 spectra from 6 reference samples of the substance/substance group *Magnesium hydrogen aspartate tetrahydrate*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Magnesium hydrogen aspartate…	1012021-01	20384	40
Euro OTC	Magnesium hydrogen aspartate…	1012021-01	20441	40
Euro OTC	Magnesium hydrogen aspartate…	1012021	20614	40
Euro OTC	Magnesium hydrogen aspartate…	1306045-01	21749†	20
Euro OTC	Magnesium hydrogen aspartate…	1707010	23552	40
Euro OTC	Magnesium hydrogen aspartate…	1707010	23608	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 853 spectra from a total of 3495 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 4 spectra from 2 *Apo-Ident* customers from 4 batches from the substance/substance group *Magnesium hydrogen aspartate tetrahydrate*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Euro OTC	Magnesium hydrogen aspartate…	1605031-01	1
Euro OTC	Magnesium hydrogen aspartate…	1204014-01	1
Euro OTC	Magnesium hydrogen aspartate…	1012021-01	1
Euro OTC	Magnesium hydrogen aspartate…	1504036-01	1

- 77 155 spectra from 463 *Apo-Ident* customers from a total of 25 543 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Magnesium hydrogen aspartate tetrahydrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Magnesium hydrogen aspartate tetrahydrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	180	40	161 853
Type C	0	3	1	77 155

The substance/substance group *Magnesium hydrogen aspartate tetrahydrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	81.8182 % (> 80.4545 %)
Type C	100.0000 % (> 99.8853 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several

new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20812	20812	0.00	45.18
21749	20812	4.61	44.81
22682	22682	0.00	45.81

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Magnesium hydrogen citrate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20016-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Magnesium hydrogen citrate; Magnesii hydrogenocitras hydricus; Magnesii hydrogenocitricum hydricum; Magnesium hydrogen citrate, hydrated

Special notes

When selecting the *Magnesium hydrogen citrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Magnesium hydrogen citrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Magnesium hydrog…	13389102	21445	40	20131205
Euro OTC	Magnesium hydrog…	1507010	21873	40	20150713*
Euro OTC	Magnesium hydrog…	1510033	22233	40	20151117*
Euro OTC	Magnesium hydrog…	1601005	22296	40	20160119*
Euro OTC	Magnesium hydrog…	1701003	22992	40	20170124*
Caelo	Magnesium hydrog…	15415014	23240	40	20160105

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 240 spectra of 6 reference samples from the substance/substance group *Magnesium hydrogen citrate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 6 different batches.

- 72 193 spectra from a total of 1576 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 595 spectra from 16 reference samples of the substance/substance group *Magnesium hydrogen citrate*.

- These include spectra of independent samples from 12 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Magnesium hydrogen citrate	90396239	20016	75
Caelo	Magnesium hydrogen citrate	11372907	20595	40
Euro OTC	Magnesium hydrogen citrate	1110026-02	20599	40
Dr. Paul Lohmann	Magnesium hydrogen citrate	1048115	20615	40
Caelo	Magnesium hydrogen citrate	13389102	21445†	20
Euro OTC	Magnesium hydrogen citrate	1507010	21873†	20
Euro OTC	Magnesium hydrogen citrate	1510033	22233†	20
Euro OTC	Magnesium hydrogen citrate	1601005	22296†	20
Euro OTC	Magnesium hydrogen citrate	1604002	22509	40
Euro OTC	Magnesium hydrogen citrate	1608004	22796	40
Euro OTC	Magnesium hydrogen citrate	1701004	22991	40

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*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Magnesium hydrogen citrate	1705010	23380	40
Euro OTC	Magnesium hydrogen citrate	1705009	23382	40
Euro OTC	Magnesium hydrogen citrate	1710007	23771	40
Caelo	Magnesium hydrogen citrate	173531	23788	40
Euro OTC	Magnesium hydrogen citrate	1802026	24064	40

- 161 478 spectra from a total of 3483 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 507 spectra from 149 *Apo-Ident* customers from 179 batches from the substance/substance group *Magnesium hydrogen citrate*.

- These include spectra of independent samples from 174 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Magnesium hydrogen citrate	14265516	1
Caelo	Magnesium hydrogen citrate	15296709	5
Caelo	Magnesium hydrogen citrate	15296801	5
Caelo	Magnesium hydrogen citrate	15415005	2
Caelo	Magnesium hydrogen citrate	15415010	8
Euro OTC	Magnesium hydrogen citrate	1604002-01	23
	Magnesium hydrogen citrate	1058172	1
Caelo	Magnesium hydrogen citrate	12175810	4
Caelo	Magnesium hydrogen citrate	12175807	3
Fagron	Magnesium hydrogen citrate	10D28-N22	1
Euro OTC	Magnesium hydrogen citrate	1110026-01	3
GEHE	Magnesium hydrogen citrate	1110026-02	1
Caelo	Magnesium hydrogen citrate	11193115	1
Caelo	Magnesium hydrogen citrate	1137199	1
Caelo	Magnesium hydrogen citrate	11372901	4
Caelo	Magnesium hydrogen citrate	11372902	1
Caelo	Magnesium hydrogen citrate	1137291	1
Fagron	Magnesium hydrogen citrate	11H05-N07	1
Caelo	Magnesium hydrogen citrate	12091303	1
Caelo	Magnesium hydrogen citrate	12175802	7
Herbasinica	Magnesium hydrogen citrate	12238002	5
Caelo	Magnesium hydrogen citrate	12238012	3
Caelo	Magnesium hydrogen citrate	12368003	9
Fagron	Magnesium hydrogen citrate	12A30-N03	2
Caelo	Magnesium hydrogen citrate	12368004	6
Fagron	Magnesium hydrogen citrate	12A30-N30	1

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[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Supplier	Substance	Batch	Spectra
Fagron	Magnesium hydrogen citrate	12G10-N01	3
Fagron	Magnesium hydrogen citrate	12H28-N11	4
Caelo	Magnesium hydrogen citrate	7011504	1
Caelo	Magnesium hydrogen citrate	26101203	1
Caelo	Magnesium hydrogen citrate	1014E-01829	1
Dr. Paul Lohmann	Magnesium hydrogen citrate	1077866	2
Euro OTC	Magnesium hydrogen citrate	1080144	1
Euro OTC	Magnesium hydrogen citrate	1306034-02	4
Euro OTC	Magnesium hydrogen citrate	1311003-01	13
Caelo	Magnesium hydrogen citrate	13233907	2
Caelo	Magnesium hydrogen citrate	13233913	8
Caelo	Magnesium hydrogen citrate	13233910	6
Caelo	Magnesium hydrogen citrate	13389111	5
Alliance Health 05.09.2...	Magnesium hydrogen citrate	13389111	2
Euro OTC	Magnesium hydrogen citrate	1404023-01	7
VDL;27.02.15	Magnesium hydrogen citrate	13389111	1
Euro OTC	Magnesium hydrogen citrate	1407048-01	5
Euro OTC	Magnesium hydrogen citrate	1407048-02	5
Caelo	Magnesium hydrogen citrate	14265503	10
Caelo	Magnesium hydrogen citrate		1
Caelo	Magnesium hydrogen citrate	14265504	5
Caelo	Magnesium hydrogen citrate	14265517	1
Nowed18.08.2015	Magnesium hydrogen citrate	14265521	1
Fagron	Magnesium hydrogen citrate	14I12-B02-298854	1
Fagron	Magnesium hydrogen citrate	14K27-B03-305254	1
Euro OTC	Magnesium hydrogen citrate	1507010-01	12
Euro OTC	Magnesium hydrogen citrate	1510033-01	2
Caelo	Magnesium hydrogen citrate	15296701	6
phönix	Magnesium hydrogen citrate	15296702	1
Caelo	Magnesium hydrogen citrate	15415001	4
Caelo	Magnesium hydrogen citrate	15415002	1
Phönix	Magnesium hydrogen citrate	15415005	1
Caelo	Magnesium hydrogen citrate	15415009	3
Euro OTC	Magnesium hydrogen citrate	1601005-01	10
phönix	Magnesium hydrogen citrate	1601005-01	2
Euro OTC	Magnesium hydrogen citrate	1604002-001	1
phönix	Magnesium hydrogen citrate	1604002-01	1
Euro OTC	Magnesium hydrogen citrate	1604002-012x	1
Euro OTC	Magnesium hydrogen citrate	1604002-02	7
Euro OTC	Magnesium hydrogen citrate	1608004-01	11
Caelo	Magnesium hydrogen citrate	16341708	2
phönix	Magnesium hydrogen citrate	16341709	2
Euro OTC	Magnesium hydrogen citrate	1701003-01	3
Euro OTC	Magnesium hydrogen citrate	1705009-01	1
ACM	Magnesium hydrogen citrate	KNC0829J15	1
Gehe/EuRho	Magnesium hydrogen citrate	112E-01829	1
Dr. Paul Lohmann	Magnesium hydrogen citrate	1079474	1
Eu Rho	Magnesium hydrogen citrate	110600401	1
Euro OTC	Magnesium hydrogen citrate	1202034	1
Phoenix 30.07.2012	Magnesium hydrogen citrate	1202034-01	1
Eu Rho	Magnesium hydrogen citrate	1202034-01	1
Euro OTC	Magnesium hydrogen citrate	1202034-01	2
EuRho/Phönix	Magnesium hydrogen citrate	1202034-02	1
Euro OTC	Magnesium hydrogen citrate	1208006-01	6
Gehe 18.06.2013	Magnesium hydrogen citrate	1208006-02	1
Euro OTC	Magnesium hydrogen citrate	1211033-02	4
Caelo	Magnesium hydrogen citrate	12175801	1
Caelo	Magnesium hydrogen citrate	12175804	2
Gehe	Magnesium hydrogen citrate	12368014	1
Caelo	Magnesium hydrogen citrate	133233907	1

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Supplier	Substance	Batch	Spectra
Caelo	Magnesium hydrogen citrate	2368011	1
Euro OTC	Magnesium hydrogen citrate	C6H6MgO7	1
Caelo	Magnesium hydrogen citrate	13233901	11
Caelo	Magnesium hydrogen citrate	14265520	1
Euro OTC	Magnesium hydrogen citrate		2
Caelo	Magnesium hydrogen citrate	11372907	1
Caelo	Magnesium hydrogen citrate	315E-01829	1
Caelo	Magnesium hydrogen citrate	516Q-01829	1
Heide/Gehe	Magnesium hydrogen citrate	1077866	1
Heidelberger Chlorella/...	Magnesium hydrogen citrate	10032	1
Euro OTC	Magnesium hydrogen citrate	1085730	2
Caelo	Magnesium hydrogen citrate	13233906	10
Caelo	Magnesium hydrogen citrate	1311003-01	1
Caelo	Magnesium hydrogen citrate	13389106	3
Caelo	Magnesium hydrogen citrate	13389108	1
Caelo	Magnesium hydrogen citrate	13389107	3
Caelo	Magnesium hydrogen citrate	13389110	1
Caelo	Magnesium hydrogen citrate	14265505	2
Caelo	Magnesium hydrogen citrate	14265511	1
Caelo	Magnesium hydrogen citrate	14I12-B02-298854	1
Euro OTC	Magnesium hydrogen citrate	1507010-02	4
Caelo	Magnesium hydrogen citrate	14265521	1
Euro OTC	Magnesium hydrogen citrate	1501010-02	1
Caelo	Magnesium hydrogen citrate	14265513	2
phönix	Magnesium hydrogen citrate	15296710	1
Caelo	Magnesium hydrogen citrate	15296712	2
Caelo	Magnesium hydrogen citrate	15296802	1
phönix	Magnesium hydrogen citrate	15415010	1
Caelo	Magnesium hydrogen citrate	15415013	1
Caelo	Magnesium hydrogen citrate	15415014	2
phönix	Magnesium hydrogen citrate	15415015	2
Caelo	Magnesium hydrogen citrate	1604002-01	1
Caelo	Magnesium hydrogen citrate	16341709	2
phönix	Magnesium hydrogen citrate	1608004-01	1
Caelo	Magnesium hydrogen citrate	17061401	1
Caelo	Magnesium hydrogen citrate	16E02-B03-321485	1
Caelo	Magnesium hydrogen citrate	17173401	1
Caelo	Magnesium hydrogen citrate	5415013	1
ACM	Magnesium hydrogen citrate	KNC1377J15	2
Euro OTC	Magnesium hydrogen citrate	L15402018-01	1
Heidelberger/Noweda	Magnesium hydrogen citrate	1070876-2	1
Caelo	Magnesium hydrogen citrate	11044103	2
Caelo	Magnesium hydrogen citrate	11021401	1
Gehe/EuRho	Magnesium hydrogen citrate	1208006-2	1
Kehr	Magnesium hydrogen citrate	12080206-01	1
Euro OTC	Magnesium hydrogen citrate	1211033-01	5
Caelo	Magnesium hydrogen citrate	12105421	1
Anzag	Magnesium hydrogen citrate	12175802	1
Caelo	Magnesium hydrogen citrate	12238001	3
Caelo	Magnesium hydrogen citrate	12238003	1
Caelo	Magnesium hydrogen citrate	12238002	2
Caelo	Magnesium hydrogen citrate	12238004	4
Maros/Phönix	Magnesium hydrogen citrate	12238004	2
Caelo	Magnesium hydrogen citrate	12368002	5
Caelo	Magnesium hydrogen citrate	12368005	3
Caelo	Magnesium hydrogen citrate	12368011	7
Cealo	Magnesium hydrogen citrate	12368014	1
Caelo	Magnesium hydrogen citrate	12368014	2
Fagron	Magnesium hydrogen citrate	12H28-N03	1
Fagron	Magnesium hydrogen citrate	12h28-n03	1

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Supplier	Substance	Batch	Spectra
Euro OTC	Magnesium hydrogen citrate	1306034-01	3
Caelo	Magnesium hydrogen citrate	13194601	5
Caelo	Magnesium hydrogen citrate	13233904	5
Cealo	Magnesium hydrogen citrate	13233907	2
Caelo	Magnesium hydrogen citrate	13233911	4
Caelo	Magnesium hydrogen citrate	13389103	8
Caelo	Magnesium hydrogen citrate	27111306	1
Caelo	Magnesium hydrogen citrate	80446188	1
Caelo	Magnesium hydrogen citrate	11061403	1
EuRho/Phönix	Magnesium hydrogen citrate	1311003-01	1
Phoenix 15.10.14	Magnesium hydrogen citrate	1311003-01	1
Euro OTC	Magnesium hydrogen citrate	1311003-02	1
Caelo	Magnesium hydrogen citrate	133389111	1
Caelo	Magnesium hydrogen citrate	13389102	2
AHD	Magnesium hydrogen citrate	13389103	1
Sanacaorp	Magnesium hydrogen citrate	13389108	1
Fagron	Magnesium hydrogen citrate		1
Fagron	Magnesium hydrogen citrate	13K11-B02-288161	1
Fagron	Magnesium hydrogen citrate	13K11-B02-288161	1
Ichthyol/Phönix	Magnesium hydrogen citrate	14/12-B02-298854	1
Gehe Kassel	Magnesium hydrogen citrate	14/12-B02-298854	1
Euro OTC	Magnesium hydrogen citrate	140704801	1
Caelo	Magnesium hydrogen citrate	14265514	1
Fagron	Magnesium hydrogen citrate	14I12-B02	1
Euro OTC	Magnesium hydrogen citrate	1501026-01	3
Euro OTC	Magnesium hydrogen citrate	151003301	1
Fagron	Magnesium hydrogen citrate	15296701	1
Caelo	Magnesium hydrogen citrate	15296702	2
Caelo	Magnesium hydrogen citrate	15415003	3
Caelo	Magnesium hydrogen citrate	15415004	1
Euro OTC	Magnesium hydrogen citrate	160100501	1
Caelo	Magnesium hydrogen citrate	1601005-01	1
Euro OTC	Magnesium hydrogen citrate	160800401	1
Caelo	Magnesium hydrogen citrate	16341710	1
Euro OTC	Magnesium hydrogen citrate	1701004-01	1
Euro OTC	Magnesium hydrogen citrate	1710001-01	1
Caelo	Magnesium hydrogen citrate	1710007-01	1
Euro OTC	Magnesium hydrogen citrate	2114M1829	1
Caelo	Magnesium hydrogen citrate	6081301	1
Caelo	Magnesium hydrogen citrate	913M-01829	1
Euro OTC	Magnesium hydrogen citrate	Ch1404023-01	1
Euro OTC	Magnesium hydrogen citrate	1010003-01	1
Noweda	Magnesium hydrogen citrate	10163306	1
Fagron	Magnesium hydrogen citrate	1056239	1
Dr. Paul Lohmann	Magnesium hydrogen citrate	1078434	1
Caelo	Magnesium hydrogen citrate	11193104	1
Phoenix 19.03.13	Magnesium hydrogen citrate	1208006-01	1
Caelo	Magnesium hydrogen citrate	121033-01	1
Phönix	Magnesium hydrogen citrate	1211033-01	1
Post-Apotheke	Magnesium hydrogen citrate	1211033-01	1
Phönix 07.10.13	Magnesium hydrogen citrate	12368011	1
Caelo	Magnesium hydrogen citrate	12368017	2
Eu Rho	Magnesium hydrogen citrate	1306034-01	1
Euro OTC	Magnesium hydrogen citrate	130603402	1
	Magnesium hydrogen citrate	1311003-01	1
Caelo	Magnesium hydrogen citrate	13194603	1
Caelo	Magnesium hydrogen citrate	13233905	1
Fagron	Magnesium hydrogen citrate	13B22-N03	1
Fagron	Magnesium hydrogen citrate	13D30-N07	2
Fagron	Magnesium hydrogen citrate	13G02-N04	2

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Supplier	Substance	Batch	Spectra
Euro OTC	Magnesium hydrogen citrate	140402301	1
Caelo	Magnesium hydrogen citrate	16061203	1
Caelo	Magnesium hydrogen citrate	19061316	1
Caelo	Magnesium hydrogen citrate	28131-01829	1
Caelo	Magnesium hydrogen citrate	411052-2-P	1
Caelo	Magnesium hydrogen citrate	90396169	1
Euro OTC	Magnesium hydrogen citrate	Ch1211033-02	3

- 76 652 spectra from 463 *Apo-Ident* customers from a total of 25 372 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Magnesium hydrogen citrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Magnesium hydrogen citrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	240	0	72 193
Type B	0	584	11	161 478
Type C	0	484	23	76 652

The substance/substance group *Magnesium hydrogen citrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.5000 %)
Type B	100.0000 % (> 99.9928 %)	98.1513 % (> 97.6471 %)
Type C	100.0000 % (> 99.8849 %)	95.4635 % (> 94.8718 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21445	22233	5.02	37.08
21873	21873	0.00	39.72
22233	22233	0.00	39.49
22296	22296	0.00	39.81
22992	22992	0.00	40.09
23240	21873	2.36	39.95

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Magnesium orotate dihydrate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20429-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Magnesium orotate dihydrate; Magnesii orotas dihydricus; Magnesii oroticum dihydricum

Special notes

When selecting the *Magnesium orotate dihydrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Magnesium orotate dihydrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Magnesium orotat…	1511021	22287	40	20151228*
Caelo	Magnesium orotat…	162227	22638	40	20160809*
Caelo	Magnesium orotat…	16222701	23236	40	20160809
Euro OTC	Magnesium orotat…	1707018	23615	40	20170907*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 4 reference samples from the substance/substance group *Magnesium orotate dihydrate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 4 different batches.

- 72 273 spectra from a total of 1578 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 300 spectra from 8 reference samples of the substance/substance group *Magnesium orotate dihydrate*.

- These include spectra of independent samples from 7 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Pharmorgana	Magnesium orotate dihydrate	1000135398	20429	40
Euro OTC	Magnesium orotate dihydrate	1109034-01	20531	40
Euro OTC	Magnesium orotate dihydrate	1511021	22287†	20
Euro OTC	Magnesium orotate dihydrate	1608017	22784	40
Caelo	Magnesium orotate dihydrate	172157	23661	40
Caelo	Magnesium orotate dihydrate	172547	23799	40
Euro OTC	Magnesium orotate dihydrate	1712001	23874	40
Euro OTC	Magnesium orotate dihydrate	1802018	23963	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 773 spectra from a total of 3491 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 35 spectra from 15 *Apo-Ident* customers from 19 batches from the substance/substance group *Magnesium orotate dihydrate*.

- These include spectra of independent samples from 19 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Euro OTC	Magnesium orotate dihydrate	1305011-02	5
Fagron	Magnesium orotate dihydrate	12G05-N03	1
Fagron	Magnesium orotate dihydrate	14/13-B05-305616	1
Euro OTC	Magnesium orotate dihydrate	1407005-01	2
Caelo	Magnesium orotate dihydrate	14093607	2
Euro OTC	Magnesium orotate dihydrate	1511021-02	6
Euro OTC	Magnesium orotate dihydrate	1504002-01	1
Fagron	Magnesium orotate dihydrate	14E20-B05-296005	1
Euro OTC	Magnesium orotate dihydrate	1608017-01	2
Microsin Pharmorgana	Magnesium orotate dihydrate	OMR00213	1
Microsin Pharmorgana	Magnesium orotate dihydrate	ORM09114	1
Microsin Pharmorgana	Magnesium orotate dihydrate	ORM02514	1
Euro OTC	Magnesium orotate dihydrate	8120	2
Fagron	Magnesium orotate dihydrate	1000060461	1
Phoenix 22.03.13	Magnesium orotate dihydrate	1209029-01	1
Euro OTC	Magnesium orotate dihydrate	1209029-01	3
Euro OTC	Magnesium orotate dihydrate	1305011-01	1
Microsin Pharmorgana	Magnesium orotate dihydrate	ORM00213	1
Fagron	Magnesium orotate dihydrate	13H06-N07	1
Euro OTC	Magnesium orotate dihydrate	ORM00113	1

- 77 124 spectra from 463 *Apo-Ident* customers from a total of 25 529 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Magnesium orotate dihydrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Magnesium orotate dihydrate* and it was evaluated how many matches (positive) and rejections (negative) were correct

or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	160	0	72 273
Type B	0	260	40	161 773
Type C	0	34	1	77 124

The substance/substance group *Magnesium orotate dihydrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9928 %)	86.6667 % (> 85.6667 %)
Type C	100.0000 % (> 99.8850 %)	97.1429 % (> 88.5714 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
22287	22287	0.00	50.09
22638	22638	0.00	65.41
23236	23615	9.45	62.28
23615	23615	0.00	58.73

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Magnesium stearate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20707-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Magnesium stearate; Magnesii stearas; Magnesii stearinicum

Special notes

When selecting the *Magnesium stearate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Magnesium stearate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Magnesium stearate	12C29-N06	20707	110	20120418
Fagron	Magnesium stearate	12D26-B03	21084	40	1407310
Caelo	Magnesium stearate	13095536	21117	40	20130405
Caelo	Magnesium stearate	14136929	21783	40	AR-15-FG-012028-01
Euro OTC	Magnesium stearate	1502033-01	22817	40	20150317

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 270 spectra of 5 reference samples from the substance/substance group *Magnesium stearate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 5 different batches.

- 72 163 spectra from a total of 1577 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 140 spectra from 4 reference samples of the substance/substance group *Magnesium stearate*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Magnesium stearate	14136929	21783†	20
Caelo	Magnesium stearate	162066	22763	40
Euro OTC	Magnesium stearate	1608022	22821	40
Euro OTC	Magnesium stearate	1704002	23436	40

- 161 933 spectra from a total of 3495 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 15 spectra from 11 *Apo-Ident* customers from 13 batches from the substance/substance group *Magnesium stearate*.

- These include spectra of independent samples from 12 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Magnesium stearate	15155001	2
Euro OTC	Magnesium stearate	914I-01834	1
Noweda	Magnesium stearate	13D11-N08	1
Euro OTC	Magnesium stearate	315E-01834	1
Caelo	Magnesium stearate	13095515	1
Euro OTC	Magnesium stearate	1116E-01834	1
Fagron	Magnesium stearate	12D26-B03-289435	1
Caelo	Magnesium stearate	15305302	1
Caelo	Magnesium stearate	13095536	1
Caelo	Magnesium stearate	15305307	1
Caelo	Magnesium stearate	12040307	1
Caelo	Magnesium stearate	15305315	2
Euro OTC	Magnesium stearate	1912I-01834	1

- 77 144 spectra from 463 *Apo-Ident* customers from a total of 25 534 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Magnesium stearate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Magnesium stearate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	270	0	72 163
Type B	0	140	0	161 933
Type C	0	12	3	77 144

The substance/substance group *Magnesium stearate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.7778 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 95.7143 %)
Type C	100.0000 % (> 99.8850 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20707	21084	13.81	36.24
21084	21084	0.00	45.19
21117	21084	25.20	66.37
21783	21783	0.00	29.40
22817	21783	4.33	35.67

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Manganese orotate dihydrate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	22311-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Manganese orotate dihydrate

Special notes

When selecting the *Manganese orotate dihydrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Manganese orotate dihydrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Manganese orotat…	1601003	22311	40	20160113*
Euro OTC	Manganese orotat…	1801031	23908	40	20180131*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 80 spectra of 2 reference samples from the substance/substance group *Manganese orotate dihydrate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 2 different batches.

- 72 353 spectra from a total of 1580 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 100 spectra from 3 reference samples of the substance/substance group *Manganese orotate dihydrate*.

- These include spectra of independent samples from 1 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Manganese orotate dihydrate	1601003	22311†	20
Euro OTC	Manganese orotate dihydrate	1605029-01	22654	40
Euro OTC	Manganese orotate dihydrate	1605029-01	22737	40

- 161 973 spectra from a total of 3497 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 0 spectra from 0 *Apo-Ident* customers from 0 batches from the substance/substance group *Manganese orotate dihydrate*.

- These include spectra of independent samples from 0 batches, of which no spectra have been used for the generation of the database.

- 77 159 spectra from 463 *Apo-Ident* customers from a total of 25 547 batches from a further 701 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Manganese orotate dihydrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Manganese orotate dihydrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	80	0	72 353
Type B	0	92	8	161 973
Type C	0	0	0	77 159

The substance/substance group *Manganese orotate dihydrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9928 %)	92.0000 % (> 89.0000 %)
Type C	100.0000 % (> 99.8849 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
22311	22311	0.00	54.32
23908	23908	0.00	47.98

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Mannitol**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20118-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Mannitol; Mannitolum

Special notes

When selecting the *Mannitol* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Mannitol*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Mannitol	12305723	20980	40	1402329
Euro OTC	Mannitol	1508012	21884	40	20150827*
Euro OTC	Mannitol	1511025	22286	40	20151228*
Caelo	Mannitol	15197305	22581	40	20150720
Fagron	Mannitol	15A26-B01-305841	22883	40	20150204

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 200 spectra of 5 reference samples from the substance/substance group *Mannitol*. These samples are listed above in the section *calibration samples*. The reference samples originate from 5 different batches.

- 72 233 spectra from a total of 1577 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 810 spectra from 21 reference samples of the substance/substance group *Mannitol*.

- These include spectra of independent samples from 15 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Mannitol	09204712	20118	40
Caelo	Mannitol	10100026	20130	40
Euro OTC	Mannitol	1508012	21884†	20
Euro OTC	Mannitol	1511025	22286†	20
Caelo	Mannitol	160140	22458	60
Euro OTC	Mannitol	1604008	22515	40
Caelo	Mannitol	16014013	22580	40
Caelo	Mannitol	162009	22614	40
Euro OTC	Mannitol	1606031	22697	40
Caelo	Mannitol	162121	22721	40
Euro OTC	Mannitol	1610027	22862	40
Fagron	Mannitol	15A26-B01-305841	22884	40

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*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Mannitol	162121	23066	30
Euro OTC	Mannitol	1703043	23125	40
Caelo	Mannitol	170879	23296	40
Caelo	Mannitol	160140	23299	40
Caelo	Mannitol	170879	23305	40
Caelo	Mannitol	170450	23318	40
Euro OTC	Mannitol	1708005	23700	40
Caelo	Mannitol	172588	23800	40
Euro OTC	Mannitol	1802004	23966	40

- 161 263 spectra from a total of 3481 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 994 spectra from 247 *Apo-Ident* customers from 264 batches from the substance/substance group *Mannitol*.

- These include spectra of independent samples from 263 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Mannitol	14051209	9
Caelo	Mannitol	13189227	11
Caelo	Mannitol	14051231	1
Caelo	Mannitol	14323138	17
Caelo	Mannitol	12305709	20
Euro OTC	Mannitol	1502022-01	14
Caelo	Mannitol	15197313	12
Fagron	Mannitol	14G04-B07-296196	1
Caelo	Mannitol	12305710	11
Caelo	Mannitol	12305723	5
Caelo	Mannitol	1230578	1
Phagron	Mannitol	1302C004-279405	1
Euro OTC	Mannitol	1305043-01	15
Caelo	Mannitol	16011402	1
Klenk	Mannitol	5224A110314	1
Caelo	Mannitol	9204719	2
Caelo	Mannitol	10100026	3
Caelo	Mannitol	11003611	1
Caelo	Mannitol	10293140	1
Euro OTC	Mannitol	1104028-01	1
Euro OTC	Mannitol	1110009-02	6
Euro OTC	Mannitol	1110009-01	13

continued on the next page

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Supplier	Substance	Batch	Spectra
Noweda	Mannitol	11219101	2
Caelo	Mannitol	11219114	3
Noweda	Mannitol	11219115	2
Caelo	Mannitol	11219121	1
Caelo	Mannitol	11219122	1
Noweda	Mannitol	11219124	1
Caelo	Mannitol	11219124	4
Noweda	Mannitol	11219138	1
Caelo	Mannitol	11308807	2
Euro OTC	Mannitol	1205016-01	20
Phönix	Mannitol	120501602	1
Sino Phyto	Mannitol	12105403	1
Caelo	Mannitol	12105403	3
Phönix	Mannitol	12051601	1
Noweda	Mannitol	12105404	1
Caelo	Mannitol	12105404	5
Noweda	Mannitol	12105405	1
Caelo	Mannitol	12105420	7
Großhandel	Mannitol	12105420	1
Noweda	Mannitol	12105421	3
Caelo	Mannitol	12105421	11
Caelo	Mannitol	12105433	11
cesar&lorentz/Phönix	Mannitol	12305710	1
Phönix	Mannitol	12305723	1
Caelo	Mannitol	12305724	5
Caelo	Mannitol	12305726	1
Caelo	Mannitol	12305725	18
Caelo	Mannitol	12305734	2
Caelo	Mannitol	12305736	4
Caelo	Mannitol	12305740	2
Caelo	Mannitol	1305043-02	3
Euro OTC	Mannitol	1310004-02	7
Caelo	Mannitol	13189201	9
Caelo	Mannitol	13189215	19
Euro OTC	Mannitol	1305043-02	15
Caelo	Mannitol	13189206	1
Caelo	Mannitol	13189203	10
Caelo	Mannitol	13189226	4
Fagron	Mannitol	13K20-B01-287700	3
Caelo	Mannitol	14051204	8
Alliance Health 12.08.2…	Mannitol	1404034-01	2
Caelo	Mannitol	14051205	7
Caelo	Mannitol	14051215	8
Euro OTC	Mannitol	1409016-01	19
Phönix	Mannitol	14051215	1
Euro OTC	Mannitol	1409016-02	3
Caelo	Mannitol	1423120	1
Caelo	Mannitol	14323103	3
Caelo	Mannitol	14323115	3
Caelo	Mannitol	14323105	3
Caelo	Mannitol	14323120	1
Caelo	Mannitol	14323129	1
Fagron	Mannitol	14G04-B07	2
Euro OTC	Mannitol	1502022-02	6
Euro OTC	Mannitol	1511025-01	28
Caelo	Mannitol	15184101	1
Caelo	Mannitol	15197301	10
Caelo	Mannitol	15197302	6
Caelo	Mannitol	15197314	4
Fagron	Mannitol	15A26-B01-304717	4

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Supplier	Substance	Batch	Spectra
Euro OTC	Mannitol	1606031-01	11
Caelo	Mannitol	15K25-B04	1
Fagron	Mannitol	16E11-B06	1
Fagron	Mannitol	16824-B08-318962	1
xxxxx	Mannitol	xxxx	1
Caelo	Mannitol	20151012-2	1
Euro OTC	Mannitol	17/14	1
Caelo	Mannitol	2101401	1
Caelo	Mannitol	2274635	1
Caelo	Mannitol	5031304	1
Caelo	Mannitol	7071404	1
Caelo	Mannitol	9081303	1
Caelo	Mannitol	10011501	1
Euro OTC	Mannitol	1006019-01	1
Euro OTC	Mannitol	1104028-03	4
Euro OTC	Mannitol	10112014E	1
Euro OTC	Mannitol	1006019-02	1
stumpf	Mannitol	1104028-02	1
Gehe	Mannitol	110009-02	1
EuRho	Mannitol	1104028-03	1
Klenk	Mannitol	110402803	1
ANZAG am 11.05.2012	Mannitol	1104028-03	2
Caelo	Mannitol	1110009-02	1
Euro OTC	Mannitol	111100009-02	1
Caelo	Mannitol	11219101	2
Fagron	Mannitol	11219122	1
Caelo	Mannitol	11D01-N10	1
Euro OTC	Mannitol	1205016	1
Fagron	Mannitol	11L19-N15	1
Caelo	Mannitol	1205016-01	2
phönix, 13.11.2012	Mannitol	1205016-01	2
Gehe	Mannitol	1205016-01	1
EuRho	Mannitol	1205016-01	1
Noweda	Mannitol	1205016-02	2
Gehe/ Eurho	Mannitol	1205016-02	1
Euro OTC	Mannitol	1205016-02	3
Anzag 25.02.13	Mannitol	1205016-02	1
Caelo	Mannitol	1205016-02	2
Phoenix	Mannitol	120501602	1
Linden-Apotheke	Mannitol	1205016-02	1
Caelo	Mannitol	12105405	2
Caelo	Mannitol	12105438	1
Großhandel	Mannitol	12105438	3
gehe 14.08.2013	Mannitol	1211034	1
Euro OTC	Mannitol	1211034-01	10
Caelo	Mannitol	1211034-01	1
Euro OTC	Mannitol	121103401	1
ANZAG	Mannitol	1211034-01	1
Caelo	Mannitol	121103401	1
EuRho	Mannitol	1211034-01	1
Euro OTC	Mannitol	1211034-02	19
Klenk	Mannitol	1211034-02	2
Phönix	Mannitol	1211034-02	1
EuRho	Mannitol	1211034-02	1
Caelo	Mannitol	1211034-02	1
Großhandel	Mannitol	12305710	1
Hirsch	Mannitol	12305725	1
Caelo	Mannitol	12305728	1
Fagron	Mannitol	12E24-N03	1
Gehe	Mannitol	12E24-N08	1

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Supplier	Substance	Batch	Spectra
Gehe	Mannitol	12J26-N15	1
Fagron	Mannitol	12J26-N15	2
Fagron	Mannitol	12K28-N01	1
Fagron	Mannitol	12E24-N08	1
Fagron	Mannitol	1302C004	2
Fagron	Mannitol	1302C005	1
Euro OTC	Mannitol	1305043	1
gehe 10.12.13	Mannitol	1305043/01	1
Euro OTC	Mannitol	130504301	1
Phönix	Mannitol	1305043-01	1
Noweda	Mannitol	1305043-01	1
GEHE	Mannitol	130504301	1
Euro OTC	Mannitol	131000401	1
Phoenix	Mannitol	1310004-01	1
Euro OTC	Mannitol	1310004-01	15
Caelo	Mannitol	1310004-01	4
PHOENIX 24.04.2014	Mannitol	1310004-01	3
Apomix	Mannitol	1310004-01	1
Sanacorp	Mannitol	1310004-01	1
Anzag	Mannitol	1310004-02	1
Euro OTC	Mannitol	13155710	1
GEHE 24.07.2014	Mannitol	1310004-02	1
Caelo	Mannitol	13189207	8
Caesar & Loretz GmbH	Mannitol	13189207	1
Caelo	Mannitol	13189208	6
Fagron	Mannitol	13189208	1
Sanacorp	Mannitol	13189215	1
Caelo	Mannitol	13189228	1
Fagron	Mannitol	13B01-B05-287705	1
Fagron	Mannitol	13B01-B05-283812	1
Gehe	Mannitol	13E24-N01	1
Fagron	Mannitol	13E24N01	1
Fagron	Mannitol	13K20-B01-287698	2
Caelo	Mannitol	13K20-B01-287704	1
Fagron	Mannitol	13K20-B01	1
Fagron	Mannitol	13K20-B01-287706	1
Fagron	Mannitol	13K20-B01-294194	2
Fagon	Mannitol	13K20-B01-292064	1
Fagron	Mannitol	13K20-B01-294193	2
Euro OTC	Mannitol	1404034-01	22
Euro OTC	Mannitol	14003402	1
Caelo	Mannitol	1400434-01	1
Caelo	Mannitol	1404034-01	2
EuRho	Mannitol	1404034-01	1
Euro OTC	Mannitol	140403401	2
EuRhoPha	Mannitol	1404034-01	1
Gehe	Mannitol	1404034-01	1
EuRho	Mannitol	1404034-02	2
Euro OTC	Mannitol	1404034-02	17
Caelo	Mannitol	14051216	3
Caelo	Mannitol	14051229	5
Caelo	Mannitol	14051223	1
Caelo	Mannitol	1409016-01	1
Euro OTC	Mannitol	140901601	1
EuRho/GEHE	Mannitol	1409016-01	1
Lamotte/Phoenix	Mannitol	1409016-01	1
EuRho/GEHE	Mannitol	1409016-02	1
Noweda29.04.2015	Mannitol	14323113	1
Euro OTC	Mannitol	1409016-1	1
Caelo	Mannitol	14323113	1

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Supplier	Substance	Batch	Spectra
Caelo	Mannitol	14323114	3
Caelo	Mannitol	14323121	6
Caesar & Loretz GmbH	Mannitol	14323119	1
Caelo	Mannitol	14323124	2
Noweda	Mannitol	14323124	1
Caelo	Mannitol	14323126	3
Caelo	Mannitol	14323125	1
Caelo	Mannitol	14323127	3
cealo/phoenix	Mannitol	14323138	2
Cael Sanacorp 05.02.2016	Mannitol	14323138	2
phönix	Mannitol	14323138	1
Fagron	Mannitol	14G004-B07-301692	1
Fagron	Mannitol	14G04-B07-301693	1
Fagron	Mannitol	14G04-B07-301694	1
Fagron	Mannitol	14G17-B06-301921	1
Fagron	Mannitol	15/24-B04-314324	1
Fagron	Mannitol	1502022-01	3
Euro OTC	Mannitol	15002022-01	1
Euro OTC	Mannitol	1502022/01	1
Allianz Healthcare 26.0...	Mannitol	1502022-01	1
Caelo	Mannitol	1502022-01	1
Euro OTC	Mannitol	150202201	2
EuRho	Mannitol	1502022-02	1
Euro/Phönix	Mannitol	1502022-02	1
Euro OTC	Mannitol	150202202	1
Euro OTC	Mannitol	1508012-01	15
EuRho	Mannitol	1508012-01	5
Caelo	Mannitol	1508012-01	3
Gehe	Mannitol	1508012-01	1
Roquette Lestrem/Noweda	Mannitol	1508012-01	1
Euro OTC	Mannitol	1508012-02	9
EuRho	Mannitol	1508012-02	1
Euro OTC	Mannitol	151025-01	1
Euro OTC	Mannitol	151102501	2
Roquette Lestrem/Noweda	Mannitol	1511025-01	1
Caelo	Mannitol	1519713	1
Euro OTC	Mannitol	151105-01	1
Caelo	Mannitol	15197219	1
Caelo	Mannitol	15197303	1
phönix	Mannitol	15197313	2
Celo	Mannitol	15197313	1
Phoenix	Mannitol	15197314	1
Caelo	Mannitol	15197319	3
Fargon/ Noweda	Mannitol	15A26-B01-304717	1
Euro OTC	Mannitol	158012-01	1
Caelo	Mannitol	15525	1
Fagron	Mannitol	15B05-B04-304084	4
Fagron	Mannitol	15B05-B06-304302	1
Noweda	Mannitol	15B05-B06-304302	1
Caelo	Mannitol	15B05-B09-304305	1
Caelo	Mannitol	15D28-B02-309192	1
Fagron	Mannitol	15I24-B04	1
Noweda	Mannitol	15K17-B01	1
Noweda	Mannitol	15I24-B05-314323	1
sanacorp	Mannitol	15K17-B01-315560	1
Fagron	Mannitol	15K25-B05	1
Fagron	Mannitol	15K25-B04-317786	1
Fagron	Mannitol	15K25-B06-318740	1
Fagron	Mannitol	15K17-B03-314903	1
Caelo	Mannitol	16200924	2

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Supplier	Substance	Batch	Spectra
Noweda	Mannitol	15124-B05-314323	1
Fagron	Mannitol	16/28-B01-328593	2
Euro OTC	Mannitol	160027-01	1
Euro OTC	Mannitol	16006031-01	1
Caelo	Mannitol	16014005	2
Caelo	Mannitol	16014013	1
Caelo	Mannitol	16014016	1
Defektur/eigen	Mannitol	1604008-01	1
Euro OTC	Mannitol	1604008-01	16
Caelo	Mannitol	16014014	1
Euro OTC	Mannitol	1604008	1
Euro OTC	Mannitol	1604002-01	1
Caelo	Mannitol	1604008-01	1
Euro OTC	Mannitol	160408-01	1
Euro OTC	Mannitol	160601-01	1
Euro OTC	Mannitol	1606031-02	4
Caelo	Mannitol	1606031-02	1
Euro OTC	Mannitol	1610027-01	10
Caelo	Mannitol	16061401	1
ApoIdent/Noweda	Mannitol	1610027-01	1
Caelo	Mannitol	16200903	1
Caelo	Mannitol	16200904	2
Caelo	Mannitol	16200908	2
Caelo	Mannitol	16200912	1
Caelo	Mannitol	16200909	1
Caelo	Mannitol	16200913	1
Caelo	Mannitol	16200914	2
Caelo	Mannitol	16200916	1
Phönix	Mannitol	16200924	2
Caelo	Mannitol	16212101	5
allianz	Mannitol	16212101	2
Caelo	Mannitol	16212102	5
PHÖNIX	Mannitol	16212102	1
Caelo	Mannitol	16212103	1
Fagron	Mannitol	16212103	1
Caelo	Mannitol	16212104	2
Caelo	Mannitol	16212109	2
Caelo	Mannitol	16212106	1
Caelo	Mannitol	16340301	6
Caelo	Mannitol	16B24-09-320013	1
Fagron	Mannitol	16B24-B09-320013	1
Fargon/Sanacorp	Mannitol	16B24-B09-320013	1
Fagron	Mannitol	16D20-B03-320486	1
Noweda	Mannitol	16D20-B04-320487	1
Fagron	Mannitol	16E11-B07-322830	2
Fagron	Mannitol	16E11B07322830	1
Fagron	Mannitol	16F27-Bo5-324517	1
Fagron	Mannitol	16H25-B03-326639	1
Fagron	Mannitol	16H29-B05-327813	1
Fagron	Mannitol	16L15-B04	1
EuRho/Noweda	Mannitol	1703043-01	1
Fagron	Mannitol	17/13-B11-341331	1
Caelo	Mannitol	17045001	1
Fagron	Mannitol	17045002	1
Caelo	Mannitol	17045003	1
Caelo	Mannitol	17045004	1
Caelo	Mannitol	17087908	4
Fagron	Mannitol	170980-0002	1
Fagron	Mannitol	17A27-B02-331292	4
Fragron/Noweda	Mannitol	17A12-B04-330729	1

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Supplier	Substance	Batch	Spectra
Fagron	Mannitol	17A27-B02	1
EuRho	Mannitol	1911M-01844	1
Caelo	Mannitol	23082013C	1
Caelo	Mannitol	24101306	1
Caelo	Mannitol	2713M-01844	2
Caelo	Mannitol	30031502	1
Caelo	Mannitol	30121417	1
Caelo	Mannitol	48558	1
Caelo	Mannitol	4414E-01844	1
Fagron	Mannitol	720014-0002	1
Fagron	Mannitol	E616X	1
Euro OTC	Mannitol	E671Z	1
Fagron	Mannitol	E717A	1
Euro OTC	Mannitol	T03-07/1409016-01	1
Anzag	Mannitol	111000902	1
Caelo	Mannitol	12305725-3444311112	1
Fagron	Mannitol	1302C004-279405	1
EuRho/Sanac	Mannitol	1305043-01	1
Gutenberg-Apotheke	Mannitol	1310004-01	4
Fagron	Mannitol	1302c005	1
Caelo	Mannitol	13095013	1
Gutenberg-Apotheke	Mannitol	1310004-02	1
Caelo	Mannitol	13189203-3566412081	1
Euro OTC	Mannitol	13189216	2
Gutenberg-Apotheke	Mannitol	13189221	1
Caelo	Mannitol	13189222	3
VDL;21.11.14;3,98EUR	Mannitol	13189227	1
Fagron	Mannitol	13B01-B05-283811	2
Fagron	Mannitol	13K20-B01-292064	2
Caelo	Mannitol	14051207	1
Caelo	Mannitol	14051208	2
Caelo	Mannitol	14051217	2
Caelo	Mannitol	14051224	2
Caelo	Mannitol	14051230	2
Caelo	Mannitol	1405127	1
Caelo	Mannitol	14323101	3
Fagron	Mannitol	15K17-B01-315560	1
Caelo	Mannitol	1612101	1
Fagron	Mannitol	E687X	1
Caelo	Mannitol	P154/14	1

- 76 165 spectra from 462 *Apo-Ident* customers from a total of 25 293 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Mannitol* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Mannitol* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	200	0	72 233
Type B	0	810	0	161 143
Type C	0	949	45	76 151

The substance/substance group *Mannitol* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 99.2593 %)
Type C	100.0000 % (> 99.8851 %)	95.4728 % (> 95.1710 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20980	20980	0.00	50.16
21884	21884	0.00	49.35
22286	22286	0.00	47.87
22581	22286	6.38	45.59
22883	21884	2.60	48.73

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Melatonin**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20553-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Melatonin; Melatoninum

Special notes

When selecting the *Melatonin* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Melatonin*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Melatonin	12321404	20834	37	20121107
Caelo	Melatonin	12321411	20835	40	20121107
Caelo	Melatonin	12321415	20987	80	20121107
Euro OTC	Melatonin	1305029-02	21618	40	1411054
Euro OTC	Melatonin	1510041	22237	40	20151123*

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Melatonin	15G06-B03-315183	22892	40	20150717
Fagron	Melatonin	15G06-B03-323733	22893	40	20150717
Euro OTC	Melatonin	1709020	23889	40	20180105*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 357 spectra of 8 reference samples from the substance/substance group *Melatonin*. These samples are listed above in the section *calibration samples*. The reference samples originate from 8 different batches.

- 72 076 spectra from a total of 1574 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 380 spectra from 10 reference samples of the substance/substance group *Melatonin*.

- These include spectra of independent samples from 4 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Melatonin	09366205	20106	40
Caelo	Melatonin	11267102	20553	40
Euro OTC	Melatonin	1305029-02	21618†	20
Euro OTC	Melatonin	1510041	22237†	20
Euro OTC	Melatonin	1610040	22871	40
Caelo	Melatonin	163437	23036	40

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*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Melatonin	1510041	22237SI	60
Fagron	Melatonin	15G06-B03-315183	22892SI	40
Fagron	Melatonin	15G06-B03-323733	22893SI	40
Caelo	Melatonin	163437	23036SI	40

- 161 693 spectra from a total of 3491 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 336 spectra from 102 *Apo-Ident* customers from 123 batches from the substance/substance group *Melatonin*.

- These include spectra of independent samples from 119 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Melatonin	10071303	1
Caelo	Melatonin	10296623	1
Cealo/Gehe	Melatonin	10296624	1
Gehe	Melatonin	11/26-N07	1
Inresa	Melatonin	110005	1
ANZAG am 30.04.2012	Melatonin	11267102	1
Noweda	Melatonin	11267102	2
Caelo	Melatonin	11267108	1
Phönix, 31.10.2012	Melatonin	11267109	1
Caelo	Melatonin	11267109	4
Caelo	Melatonin	11267110	1
Phönix Gotha	Melatonin	11267110	2
Noweda	Melatonin	11267111	1
Caelo	Melatonin	11267111	1
Caelo	Melatonin	11267114	1
Anzag 17.12.12	Melatonin	11267114	2
Caelo	Melatonin	11267119	1
Noweda	Melatonin	11267119	1
Sanacorp	Melatonin	11267119	1
Caelo	Melatonin	11267120	4
Phönix Gotha	Melatonin	11267120	1
Caelo	Melatonin	11267121	4
Gehe 10.04.2013	Melatonin	11267121	1
Caelo	Melatonin	11267122	2
Noweda	Melatonin	11267126	1
Caelo	Melatonin	11267126	3
Fagron	Melatonin	11F09-N02	1

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[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Supplier	Substance	Batch	Spectra
Gehe	Melatonin	11L21-N04	1
Euro OTC	Melatonin	120008	1
Caelo	Melatonin	120009	1
Fagron	Melatonin	120009	2
Euro OTC	Melatonin	12001	2
Anzag 10.08.2012	Melatonin	1204003-01	1
Euro OTC	Melatonin	1204003-02	14
	Melatonin	1204003-02	2
Euro OTC	Melatonin	120400302	1
Phönix 02.01.2014	Melatonin	1204003-02	1
10 17.07.2013	Melatonin	1231415	1
Caelo	Melatonin	12321404	3
Caelo	Melatonin	12321406	6
Caelo	Melatonin	12321415	3
Gehe am 20.03.2013	Melatonin	12321406	1
gehe 12.09.13	Melatonin	12321415	1
Caelo	Melatonin	12321411	2
Anzag	Melatonin	12321415	1
Caelo	Melatonin	12321416	6
Caelo	Melatonin	12321421	2
Caelo	Melatonin	12321422	6
Cealo	Melatonin	12321422	1
Anzag 22.02.13	Melatonin	1267121	2
Caelo	Melatonin	1296630	1
Fgron	Melatonin	12G19-N03	1
Gehe	Melatonin	12G19-N03	2
Phoenix 03.04.2014	Melatonin	12J19-N02	1
Fagron	Melatonin	12K13-N02	1
Fagron	Melatonin	1305029-01	1
Euro OTC	Melatonin	1305029-01	12
Euro OTC	Melatonin	1305092-01	1
Caelo	Melatonin	13167301	10
Phönix 19.02.2014	Melatonin	13167301	2
gehe	Melatonin	13167301	1
GEHE 22.03.2014	Melatonin	13167302	1
Caelo	Melatonin	13167302	1
Caelo	Melatonin	13167309	1
Caelo	Melatonin	13167310	1
Caelo	Melatonin	13167312	3
Caelo	Melatonin	13167314	7
Fagron	Melatonin	13D12-N10	2
Fagron	Melatonin	13D12N10	1
Gehe	Melatonin	13D12-N10	1
Gehe	Melatonin	13E22-N12	1
Fagron	Melatonin	13e22-n12	1
PHOENIX 14.04.2014	Melatonin	13E22-N12	1
Fagron	Melatonin	13E22N12	1
Fagron	Melatonin	13E22-N12	1
Fagron	Melatonin	13H21-N06	4
Phönix 02.01.15	Melatonin	13H21-N06	1
Fagron	Melatonin	13H21-N065x	1
Fagron	Melatonin	13H29-B03	1
Fagron	Melatonin	13H29-B03-291180	5
Koisser	Melatonin	140202	2
Cactus Botanics	Melatonin	140610-C061	1
Euro OTC	Melatonin	1407028-01	1
Euro OTC	Melatonin	1407028-02	2
Caelo	Melatonin	14110302	2
Caelo	Melatonin	14110303	1
Caelo	Melatonin	14110305	2

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Supplier	Substance	Batch	Spectra
Caelo	Melatonin	14110308	3
Caelo	Melatonin	14110316	2
Caelo	Melatonin	14110314	1
sanacorp	Melatonin	14110320	1
Fagron	Melatonin	14G18-B01-297242	1
Fagron	Melatonin	14G18-B01-297244	1
Fagron	Melatonin	14G18-B01-297245	3
Caelo	Melatonin	15093001	8
Caelo	Melatonin	150601	1
Caelo	Melatonin	15093002	2
Caelo	Melatonin	15093004	1
Caelo	Melatonin	15093008	3
Caelo	Melatonin	15093010	5
Caelo	Melatonin	15093012	2
Euro OTC	Melatonin	1510041-01	3
Caelo	Melatonin	1514E-03554	1
Caelo	Melatonin	1524309	1
Caelo	Melatonin	15254305	6
Caelo	Melatonin	15254306	8
Alliance	Melatonin	15254307	3
Caelo	Melatonin	15254307	4
Caelo	Melatonin	15254308	8
phönix	Melatonin	15254308	1
Caelo	Melatonin	15254313	2
Alliance	Melatonin	15254316	1
Euro OTC	Melatonin	15254316	1
Caelo	Melatonin	15254319	4
Caelo	Melatonin	15254320	4
Caelo	Melatonin	15254321	4
Caelo	Melatonin	15254324	4
allianz	Melatonin	15254324	1
Caelo	Melatonin	15254327	1
Alte Apotheke	Melatonin	15254328	1
Caelo	Melatonin	15254328	2
Caelo	Melatonin	15254331	4
Caelo	Melatonin	15254336	3
Caelo	Melatonin	15254338	4
Phoenix	Melatonin	15C20-B01	1
Fagron	Melatonin	15C20-B01-306077	1
Fagron	Melatonin	15C20-B01-306078	3
Fagron	Melatonin	15C20-B01-308426	1
Fagron	Melatonin	15C20-B01-308427	4
Fagron	Melatonin	15G06-B03-315183	2
Fagron	Melatonin	15G06-B03-321298	1
gepepharm	Melatonin	15G06-B03-315183	1
Caelo	Melatonin	16121303	1
Caelo	Melatonin	16266901	3
Caelo	Melatonin	16266906	3
Caelo	Melatonin	16266908	1
Caelo	Melatonin	16266909	4
Fagron	Melatonin	16343702	1
Sanacorp	Melatonin	16266909	1
Caelo	Melatonin	16343705	1
Sanaorp	Melatonin	16343707	1
Caelo	Melatonin	16343707	1
Caelo	Melatonin	16343709	2
Fagron	Melatonin	16343708	1
Caelo	Melatonin	16343713	1
Fagron	Melatonin	16G06-B01	1
Fargon GmbH & Co.KG	Melatonin	16G06-B01-324743	1

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Supplier	Substance	Batch	Spectra
Caelo	Melatonin	20021312	1
Caelo	Melatonin	20021505	1
Caelo	Melatonin	2313M03554	1
Euro OTC	Melatonin	CH1305029-01	1
Farmalabor / Farmalabor	Melatonin	P1201556-000	1
KS Pharma	Melatonin	XPS130428	1
Caelo	Melatonin	14110313	1
Caelo	Melatonin	1126109	1
Phönix	Melatonin	11267111	1
Caelo	Melatonin	11267128	1
Caelo	Melatonin	12321403	1
Fagron	Melatonin	12G19-N03	1

- 76 823 spectra from 463 *Apo-Ident* customers from a total of 25 424 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Melatonin* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Melatonin* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	357	0	72 076
Type B	0	379	1	161 693
Type C	0	304	32	76 823

The substance/substance group *Melatonin* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9887 %)	100.0000 % (> 98.3193 %)
Type B	100.0000 % (> 99.9928 %)	99.7368 % (> 98.9474 %)
Type C	100.0000 % (> 99.8849 %)	90.4762 % (> 89.5833 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

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Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20834	21618	23.50	46.87
20835	22237	4.43	37.56
20987	21618	2.73	37.00
21618	21618	0.00	37.48
22237	22237	0.00	37.49
22892	22237	2.95	36.96
22893	22237	4.52	36.57
23889	23889	0.00	36.40

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Menthol**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20036-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Menthol; Levomentholum; Mentholum

Special notes

When selecting the *Menthol* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Menthol*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Menthol	13377404	21443	40	20131212
Euro OTC	Menthol	1403022-02	21601	30	20140408
Euro OTC	Menthol	1509045	21932	40	20151008*
Euro OTC	Menthol	1603024	22657	40	20160429*
Euro OTC	Menthol	1608012	22825	40	20160902*
Fagron	Menthol	16L20-T04-044769	23596	40	20170116

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 230 spectra of 6 reference samples from the substance/substance group *Menthol*. These samples are listed above in the section *calibration samples*. The reference samples originate from 6 different batches.

- 72 203 spectra from a total of 1576 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 460 spectra from 13 reference samples of the substance/substance group *Menthol*.

- These include spectra of independent samples from 9 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Menthol	82621209	20036	30
Caelo	Menthol	82621429	20078	20
Caelo	Menthol	10157605	20273	40
Caelo	Menthol	13377404	21443†	20
Euro OTC	Menthol	1403022-02	21601†	30
Euro OTC	Menthol	1509045	21932†	20
Caelo	Menthol	160956	22452	60
Euro OTC	Menthol	1701014	23005	40
Caelo	Menthol	170927	23312	40
Euro OTC	Menthol	1705022	23427	40
Caelo	Menthol	170927	23645	40
Caelo	Menthol	171889	23668	40
Euro OTC	Menthol	1802003	23951	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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- 161 613 spectra from a total of 3487 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 615 spectra from 278 *Apo-Ident* customers from 173 batches from the substance/substance group *Menthol*.

- These include spectra of independent samples from 168 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Andreas Imhof	Menthol	8052015	1
Caelo	Menthol	13377409	9
Fagron	Menthol	13J21-N04	2
Caelo	Menthol	1403022-02	1
Euro OTC	Menthol	1410004-02	8
Caelo	Menthol	14183004	13
Fagron	Menthol	14H29-M02	9
Euro OTC	Menthol	1502006-02	15
Caelo	Menthol	14183006	1
Caelo	Menthol	15076101	8
Fagron	Menthol	15076113	2
Caelo	Menthol	15076113	4
Caelo	Menthol	15076112	10
Fagron	Menthol	11G19-N07	1
Caelo	Menthol	15363803	2
Fagron	Menthol	858607	1
Caelo	Menthol	15286216	1
Caelo	Menthol	15363815	4
Imhof	Menthol	15-5401	1
Caelo	Menthol	314Q01855	1
Fagron	Menthol	12/19-N10	2
Euro OTC	Menthol	1204036-01	10
Euro OTC	Menthol	1210017-01	5
Euro OTC	Menthol	120403602	3
Fagron	Menthol	12G20-N02	5
Fagron	Menthol	12C05-N03	2
Caelo	Menthol	13103901	28
Caelo	Menthol	750137	1
Fagron	Menthol	13D16-N09	8
Fagron	Menthol	750137	2
Anzag	Menthol	12/19-N10	1
Noweda	Menthol	12020403	2
Euro OTC	Menthol	120403601	1
Fagron	Menthol	12F01-N14	2
Caelo	Menthol	1320260	2

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[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Supplier	Substance	Batch	Spectra
Caelo	Menthol	515A-01855	1
Caelo	Menthol	515M-01855	1
Caelo	Menthol	7111201	1
Euro OTC	Menthol	6102014B	1
Caelo	Menthol	9221710	1
Finze	Menthol	9221710	1
Caelo	Menthol	930716	1
Caelo	Menthol	1/AD1	1
Caelo	Menthol	10008029-02	1
Euro OTC	Menthol	1002019-03	1
Euro OTC	Menthol	1008029-01	1
Caelo	Menthol	10157615	1
Euro OTC	Menthol	1105028-01	1
Caelo	Menthol	11091405	1
Caelo	Menthol	1111020-01	4
Euro OTC	Menthol	1111020-01	1
Caelo	Menthol		1
Caelo	Menthol	11202907	1
Caelo	Menthol	11202901	2
Euro OTC	Menthol	1111020-02	1
Caesar & Loretz GmbH, 4...	Menthol	11202910	1
Caelo	Menthol	11202910	6
Caelo	Menthol	11202912	2
Gehe/ 27.10.12 EuRho	Menthol	11219216	1
Fagron	Menthol	11C01-N01	1
Caesar & Loretz GmbH, 4...	Menthol	12020402	1
Caelo	Menthol	12020402	6
Caelo	Menthol	12020403	1
Großhandel	Menthol	12020403	1
Caesar/Noweda	Menthol	12020403	1
Caelo	Menthol	12020408	1
Caelo	Menthol	1202041	1
Caelo	Menthol	12020410	1
Caelo	Menthol	12020411	9
Euro OTC	Menthol	12020411	1
Gehe	Menthol	12020411	1
Caesar & Loretz GmbH, 4...	Menthol	12020411	1
Noweda	Menthol	1204036-01	1
Caelo	Menthol	1204036-01	1
Sanacorp	Menthol	1204036-01	1
Gehe	Menthol	1204036-01	1
Euro OTC	Menthol	120-4036-02	2
Euro OTC	Menthol	1204036-02	3
EuRho	Menthol	1204036-02	1
euRho	Menthol	1204036-02	1
Euro OTC	Menthol	1204036-1	1
Sanacorp	Menthol	1210017-01	1
Euro OTC	Menthol	1210017-02	12
Fagron	Menthol	1219-N10	1
Phönix	Menthol	12246204	1
Caelo	Menthol	12246204	1
Caelo	Menthol	12246205	12
Anzag 03.05.2013	Menthol	12246205	1
Caelo	Menthol	12246211	4
Caesar/Noweda	Menthol	12246211	1
Phoenix 15.04.2014	Menthol	12246211	1
v.d.l	Menthol		1
FARGON	Menthol	12c05-n03	1
Fagron	Menthol	12Cos-N03	1
Fagron	Menthol	12D23-N06	4

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Supplier	Substance	Batch	Spectra
Fagron	Menthol	12I19-N10	2
Frey*Lau GmbH	Menthol	1305010-01	1
Caelo	Menthol	130501001	1
Euro OTC	Menthol	1305010-01	9
AHD	Menthol	1305010-01	1
Sanacorp	Menthol	1305010-01	1
EuRho	Menthol	1305010-01	1
Euro OTC	Menthol	1305010-02	6
Alliance Health 14.04..14	Menthol	1305010-02	1
Euro OTC	Menthol	130501002	1
Europharm	Menthol	130501-01	1
Retest	Menthol	1305010-02	1
Caelo	Menthol	13103802	1
Caesar & Loretz GmbH, 4...	Menthol	13103901	1
Phönix 30.10.13	Menthol	13103901	1
Euro OTC	Menthol	1310J-01855	1
Caelo	Menthol	13159104	4
Caelo	Menthol	13159105	19
Phönix	Menthol	13159105	1
Caelo	Menthol	13377404	14
Caelo	Menthol	13377402	3
Caelo	Menthol	13159110	2
Caelo	Menthol	13377407	3
Caelo	Menthol	13377408	4
Caelo	Menthol	13377412	3
Gehe	Menthol	13377412	1
Caelo	Menthol	13377413	2
Gehe	Menthol	13D16-N09	1
Caelo	Menthol	13D16-N09	1
Fagron	Menthol	13D16-N090631/1300	1
Fagron	Menthol	13G09-N09	1
Fagron	Menthol	13G09-N090204/520	1
Fagron	Menthol	13O16-N09	1
Euro OTC	Menthol	140302201	2
Euro OTC	Menthol	1403022-01	3
Caelo	Menthol	1403022-01	1
Euro OT	Menthol	1403022-01	1
Phoenix	Menthol	1403022-02	1
Euro OTC	Menthol	1403022-02	8
Euro OTC	Menthol	14030222-02	1
Euro OTC	Menthol	140322-01	1
Euro OTC	Menthol	1410004-01	16
Caelo	Menthol	1410004-01	2
Euro OTC	Menthol	141000401	1
Phönix Gotha	Menthol	1410004-01	1
Noweda	Menthol	1410004-01	1
Caelo	Menthol	1410004-02	1
Caelo	Menthol	14183008	4
Caelo	Menthol	14183011	1
Caelo	Menthol	14183012	2
Caelo	Menthol	14183014	4
Caelo	Menthol	14183017	3
Caelo	Menthol	14183020	1
Fagron	Menthol	14H29-M04	1
Euro OTC	Menthol	15020006-02	1
Euro OTC	Menthol	1502006	1
Euro OTC	Menthol	1502006-01	15
Euro OTC	Menthol	150200601	1
Fagron	Menthol	15076101	1
Caelo	Menthol	15076104	1

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Supplier	Substance	Batch	Spectra
Caelo	Menthol	15076106	7
Caesar&Loretz,Phönix	Menthol	15076106	1
Caesar/Noweda	Menthol	15076111	2
Caelo	Menthol	15076115	1
Caelo	Menthol	15076215	1
Caelo	Menthol	15076219	1
Euro OTC	Menthol	1509045	2
Euro OTC	Menthol	1509045-01	2
Euro OTC	Menthol	1509045-02	4
Euro OTC	Menthol	150904502	1
Fagron	Menthol	1509045-03	1
Euro OTC	Menthol	1509045-03	7
Frey & Lau GmbH/Noweda	Menthol	1509045-03	2
Apo-ident	Menthol	1509045-03	1
Norex Flavours Pvt. Ltd...	Menthol	15286205	1
Norex Flavours Pvt. Ltd...	Menthol	15286207	1
Caelo	Menthol	15286212	1
Caelo	Menthol	15363804	8
Caelo	Menthol	15363805	4
phönix	Menthol	15363805	1
Noweda	Menthol	15363809	1
Caelo	Menthol	15363809	4
Caelo	Menthol	15363810	5
Caelo	Menthol	1536815	1
Euro OTC	Menthol	1603021-01	1
Euro OTC	Menthol	1603024-01	19
Caelo	Menthol	1603024-01	1
Euro OTC	Menthol	1608012-01	10
Euro OTC	Menthol	160801201	1
Caelo	Menthol	1608012-02	1
Euro OTC	Menthol	1608012-02	4
Euro OTC	Menthol	1608012-1	1
Euro OTC	Menthol	1608012-12	1
Caelo	Menthol	16095603	1
Ichthyol / Phoenix	Menthol	16095603	1
Gehe	Menthol	16095602	1
Caelo	Menthol	16095604	1
Caelo	Menthol	16095606	6
Caelo	Menthol	16095613	5
Caelo	Menthol	16095614	2
Caelo	Menthol	16095616	1
Caelo	Menthol	16095619	1
Fagron	Menthol	1616Q-01855	1
Fagron	Menthol	16L20-T04-044769	1
Euro OTC	Menthol	1701014-01	4
EuRho/Alliance	Menthol	1701014-01	1
Euro OTC	Menthol	1701014-02	3
Euro OTC	Menthol	170101402	2
Euro Ph. / Gehe	Menthol	1701014-02	1
Noweda	Menthol	1701014-02	1
Caelo	Menthol	1704211855	1
Gehe	Menthol	1705022-01	1
Caelo	Menthol	1705022-01	1
Caelo	Menthol	19051401	1
Caelo	Menthol	20200712-2	1
Caelo	Menthol	25041402	1
Caelo	Menthol	25051301	1
EuRho	Menthol	2910A-01855	1
Euro OTC	Menthol	290601901	1
Caelo	Menthol	29121103	1

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Supplier	Substance	Batch	Spectra
Caelo	Menthol	4810A-01855	1
Caelo	Menthol	3912A-01855	1
Caelo	Menthol	5315I-01855	1
Fagron	Menthol	4611I-01855(NP)	1
Sanacorp	Menthol	6/AKD3	1
Euro OTC	Menthol	696773	1
Euro OTC	Menthol	721123	2
Caelo	Menthol	72173258	1
Phoenix	Menthol	750137	1
Fagron	Menthol	778301	1
Euro OTC	Menthol	807862	2
Euro OTC	Menthol	858607	1
Sanacorp	Menthol		1
Euro OTC	Menthol	Ch1204036-02	1
Caelo	Menthol	IntCh311052	1
Euro OTC	Menthol	PM14	1
Caelo	Menthol	814A-01855	1
Caelo	Menthol	12246203	1
Frey+Lau GmbH, Gehe	Menthol	1305010-02	1
Sanacorp	Menthol	13103901	1
Caelo	Menthol	687711	1

- 76 544 spectra from 463 *Apo-Ident* customers from a total of 25 378 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Menthol* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Menthol* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	226	4	72 203
Type B	0	383	77	161 613
Type C	0	570	45	76 544

The substance/substance group *Menthol* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	98.2609 % (> 96.9565 %)
Type B	100.0000 % (> 99.9928 %)	83.2609 % (> 82.6087 %)
Type C	100.0000 % (> 99.8849 %)	92.6829 % (> 92.1951 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21443	21932	2.36	85.22
21601	21932	2.88	83.83
21932	21932	0.00	90.90
22657	22657	0.00	96.42
22825	22825	0.00	80.96
23596	22825	2.19	79.06

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Mepivacaine hydrochloride**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20710-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Mepivacaine hydrochloride; Mepivacaini hydrochloridum; Mepivacainum hydrochloricum

Special notes

When selecting the *Mepivacaine hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Mepivacaine hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Mepivacaine hydr…	12A20-N12	20710	40	1401555
Fagron	Mepivacaine hydr…	13L04-B07-297077	21672	40	AR-15-FG-007876-01

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 80 spectra of 2 reference samples from the substance/substance group *Mepivacaine hydrochloride*. These samples are listed above in the section *calibration samples*. The reference samples originate from 2 different batches.

- 72 353 spectra from a total of 1580 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 60 spectra from 2 reference samples of the substance/substance group *Mepivacaine hydrochloride*.

- These include spectra of independent samples from 1 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Mepivacaine hydrochloride	13L04-B07-297077	21672†	20
Fagron	Mepivacaine hydrochloride	15I16-B01-322906	23212	40

- 162 013 spectra from a total of 3497 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 4 spectra from 4 *Apo-Ident* customers from 3 batches from the substance/substance group *Mepivacaine hydrochloride*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Mepivacaine hydrochloride	12E31-B40-305570	1
Fagron	Mepivacaine hydrochloride	13G05-N02	1
Caelo	Mepivacaine hydrochloride	13G05-N02	1
Fagron	Mepivacaine hydrochloride	12F20-N07	1

- 77 155 spectra from 463 *Apo-Ident* customers from a total of 25 544 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Mepivacaine hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Mepivacaine hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	72 353
Type B	0	60	0	162 013
Type C	0	3	1	77 155

The substance/substance group *Mepivacaine hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 90.0000 %)
Type C	100.0000 % (> 99.8853 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20710	20710	0.00	26.65
21672	21672	0.00	28.45

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Mesalazine**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	21772-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Mesalazine; Mesalazinum

Special notes

When selecting the *Mesalazine* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Mesalazine*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Mesalazine	1206029-04	21772	40	AR-15-FG-011819-01
Euro OTC	Mesalazine	1206029-04	21887	40	20140923
Fagron	Mesalazine	15H13-B06-317177	22356	40	20150827
Euro OTC	Mesalazine	1602005	22518	40	20160218*
Euro OTC	Mesalazine	1602005-01	22925	40	20160218
Fagron	Mesalazine	16I28-B02-327679	22929	40	20161128

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 240 spectra of 6 reference samples from the substance/substance group *Mesalazine*. These samples are listed above in the section *calibration samples*. The reference samples originate from 5 different batches.

- 72 193 spectra from a total of 1577 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 164 spectra from 6 reference samples of the substance/substance group *Mesalazine*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Mesalazine	1206029-04	21772†	20
Euro OTC	Mesalazine	1206029-04	21887†	20
Fagron	Mesalazine	15H13-B06-317177	22356†	20
Euro OTC	Mesalazine	1611019	22872	40
Fagron	Mesalazine	17A17-B03-336444	23934	40
Fagron	Mesalazine	16I28-B02-327679	not required	24

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 909 spectra from a total of 3494 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 7 spectra from 3 *Apo-Ident* customers from 4 batches from the substance/substance group *Mesalazine*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Euro OTC	Mesalazine	1206029-04	1
Euro OTC	Mesalazine	1602005-01	2
Euro OTC	Mesalazine	1602005-02	3
Fagron	Mesalazine	16128-B02-327679	1

- 77 152 spectra from 463 *Apo-Ident* customers from a total of 25 543 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Mesalazine* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Mesalazine* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	240	0	72 193
Type B	0	164	0	161 909
Type C	0	7	0	77 152

The substance/substance group *Mesalazine* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.5000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 96.3415 %)
Type C	100.0000 % (> 99.8851 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several

new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21772	21772	0.00	69.86
21887	21772	6.73	65.07
22356	22518	6.62	60.46
22518	22518	0.00	58.43
22925	22518	8.81	63.07
22929	22518	9.83	65.66

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Metamizol sodium monohydrate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	22634-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Metamizol sodium monohydrate; Metamizolum natricum monohydricum

Special notes

When selecting the *Metamizol sodium monohydrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Metamizol sodium monohydrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Metamizol sodium…	161610	22634	40	20160714*
Caelo	Metamizol sodium…	15362816	22666	40	20151106

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 80 spectra of 2 reference samples from the substance/substance group *Metamizol sodium monohydrate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 2 different batches.

- 72 353 spectra from a total of 1580 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 120 spectra from 3 reference samples of the substance/substance group *Metamizol sodium monohydrate*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Metamizol sodium monohydrate	15362815	22726	40
Caelo	Metamizol sodium monohydrate	161610	23313	40
Caelo	Metamizol sodium monohydrate	170584	23924	40

- 161 953 spectra from a total of 3496 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 0 spectra from 0 *Apo-Ident* customers from 0 batches from the substance/substance group *Metamizol sodium monohydrate*.

- These include spectra of independent samples from 0 batches, of which no spectra have been used for the generation of the database.

- 77 159 spectra from 463 *Apo-Ident* customers from a total of 25 547 batches from a further 701 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Metamizol sodium monohydrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Metamizol sodium monohydrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	80	0	72 353
Type B	0	107	13	161 953
Type C	0	0	0	77 159

The substance/substance group *Metamizol sodium monohydrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9928 %)	89.1667 % (> 86.6667 %)
Type C	100.0000 % (> 99.8849 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
22634	22634	0.00	47.23
22666	22634	15.71	44.10

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Methacholine chloride**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20733-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Methacholine chloride; Methacholinii chloridum; Methacholinium chloratum

Special notes

When selecting the *Methacholine chloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Methacholine chloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Methacholine chl…	12F01-N04	20733	60	1403251
Caelo	Methacholine chl…	13260303	21251	40	20130827
Caelo	Methacholine chl…	13260303	21592	40	20130827
Caelo	Methacholine chl…	162293	22635	40	20160815*
Caelo	Methacholine chl…	16229304	22661	40	20160815

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Methacholine chl...	16229301	22662	40	20160815
Fagron	Methacholine chl...	16L20-B01-329966	22976	40	20170123
Fagron	Methacholine chl...	16L20-B01-329968	22977	40	20170123

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 340 spectra of 8 reference samples from the substance/substance group *Methacholine chloride*. These samples are listed above in the section *calibration samples*. The reference samples originate from 7 different batches.

- 72 093 spectra from a total of 1575 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 580 spectra from 13 reference samples of the substance/substance group *Methacholine chloride*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Methacholine chloride	13260302	21420	60
Caelo	Methacholine chloride	13260302	21590	60
Caelo	Methacholine chloride	13260303	21592†	20
Caelo	Methacholine chloride	163299	23049	40
Caelo	Methacholine chloride	163299	23624	40
Caelo	Methacholine chloride	13260302	21420SI	60

continued on the next page

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Methacholine chloride	13260303	21592SI	60
Caelo	Methacholine chloride	162293	22635SI	40
Caelo	Methacholine chloride	16229304	22661SI	40
Caelo	Methacholine chloride	16229301	22662SI	40
Fagron	Methacholine chloride	16L20-B01-329966	22976SI	40
Fagron	Methacholine chloride	16L20-B01-329968	22977SI	40
Caelo	Methacholine chloride	163299	23049SI	40

- 161 493 spectra from a total of 3491 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 19 spectra from 10 *Apo-Ident* customers from 15 batches from the substance/substance group *Methacholine chloride*.

- These include spectra of independent samples from 15 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Methacholine chloride	10031504	1
Fagron	Methacholine chloride	13/13-N03	2
Fagron	Methacholine chloride	135000B	2
Fagron	Methacholine chloride	14D15-B05	1
anzag 18.12.14 25,19	Methacholine chloride	14G30-B03-296209	1
Fagron	Methacholine chloride	14G30-B03-296210	1
Fagron	Methacholine chloride	14G30-B03-296211	1
Fagron	Methacholine chloride	14K20-B03-300973	2
Fagron	Methacholine chloride	15F10-B02-315523	1
Fagron	Methacholine chloride	15F10-B02-315831	1
Fagron	Methacholine chloride	15F10-B02-317183	1
Fagron	Methacholine chloride	16L20-B01	1
Fagron	Methacholine chloride	24061503	1
Fagron	Methacholine chloride	312160	1
Fagron	Methacholine chloride	13G10-N05	2

- 77 140 spectra from 463 *Apo-Ident* customers from a total of 25 532 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Validation results

The validation runs checked whether the substance/substance group *Methacholine chloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Methacholine chloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	340	0	72 093
Type B	0	578	2	161 493
Type C	0	18	1	77 140

The substance/substance group *Methacholine chloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9887 %)	100.0000 % (> 98.2353 %)
Type B	100.0000 % (> 99.9928 %)	99.6552 % (> 99.1379 %)
Type C	100.0000 % (> 99.8850 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20733	20733	0.00	75.57
21251	20733	7.12	79.46
21592	20733	7.38	70.97
22635	22635	0.00	90.55
22661	20733	10.18	83.39
22662	22635	6.98	92.87
22976	20733	4.84	71.33
22977	20733	8.89	82.61

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Methionine**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20971-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Methionine; Methioninum

Special notes

When selecting the *Methionine* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Methionine*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Methionine	12K01-N03	20971	40	1402432
Euro OTC	Methionine	L1404041-01	21751	40	20140508
Fagron	Methionine	13L19-B36-295115	21786	40	20140108
Euro OTC	Methionine	1602012	22368	40	20160219*
Caelo	Methionine	15404102	22727	40	AR-17-FG-000285-02
Caelo	Methionine	16274007	23258	40	20161014

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 240 spectra of 6 reference samples from the substance/substance group *Methionine*. These samples are listed above in the section *calibration samples*. The reference samples originate from 6 different batches.

- 72 193 spectra from a total of 1576 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 220 spectra from 7 reference samples of the substance/substance group *Methionine*.

- These include spectra of independent samples from 4 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Methionine	11H05-N01	20421	40
Euro OTC	Methionine	L1404041-01	21751†	20
Fagron	Methionine	13L19-B36-295115	21786†	20
Euro OTC	Methionine	1602012	22368†	20
Euro OTC	Methionine	1609024	22787	40
Euro OTC	Methionine	1703042	23126	40
Euro OTC	Methionine	1710008	23777	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 853 spectra from a total of 3492 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 13 spectra from 4 *Apo-Ident* customers from 11 batches from the substance/substance group *Methionine*.

- These include spectra of independent samples from 10 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Methionine	13L19-B36	2
Fagron	Methionine	14G31-B02-297517	1
Fagron	Methionine	15A15-B08-307753	1
Euro OTC	Methionine	L1505001-01	1
dr.behr	Methionine	WE14020068-02	1
Fagron	Methionine	12G27-N01	1
Fagron	Methionine	12D27-N06	1
Fagron	Methionine	12K01-N03	2
Fagron	Methionine	13G09-N02	1
Fagron	Methionine	8116020107	1
Euro OTC	Methionine	1602012-01	1

- 77 146 spectra from 463 *Apo-Ident* customers from a total of 25 536 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Methionine* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Methionine* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	240	0	72 193
Type B	0	220	0	161 853
Type C	0	13	0	77 146

The substance/substance group *Methionine* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.5000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 97.2727 %)
Type C	100.0000 % (> 99.8850 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20971	20971	0.00	58.79
21751	22368	3.05	58.66
21786	22368	3.26	59.05
22368	22368	0.00	57.50
22727	22727	0.00	56.12
23258	22727	6.26	54.82

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Methoxsalen**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20233-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Methoxsalen; Methoxsalenum

Special notes

When selecting the *Methoxsalen* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Methoxsalen*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Methoxsalen	130604101	21555	40	20130805
Euro OTC	Methoxsalen	1506013	21862	40	20150706*
Euro OTC	Methoxsalen	1608019	22785	40	20160913*
Fagron	Methoxsalen	15J15-B03-321321	23165	40	20151124
Caelo	Methoxsalen	16103003	23167	40	20160415
Caelo	Methoxsalen	170781	23346	40	20170427*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 240 spectra of 6 reference samples from the substance/substance group *Methoxsalen*. These samples are listed above in the section *calibration samples*. The reference samples originate from 6 different batches.

- 72 193 spectra from a total of 1576 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 550 spectra from 15 reference samples of the substance/substance group *Methoxsalen*.

- These include spectra of independent samples from 4 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Methoxsalen	2909040-02	20233	40
Fagron	Methoxsalen	11F21-N02	20543	40
Euro OTC	Methoxsalen	130604101	21555†	20
Euro OTC	Methoxsalen	1506013	21862†	20
Caelo	Methoxsalen	16103014	23166	40
Caelo	Methoxsalen	170781	23333	40
Euro OTC	Methoxsalen	1802021	24070	40
Euro OTC	Methoxsalen	130604101	21555SI	55
Euro OTC	Methoxsalen	1506013	21862SI	45
Euro OTC	Methoxsalen	1608019	22785SI	34
Fagron	Methoxsalen	15J15-B03-321321	23165SI	30
Caelo	Methoxsalen	16103014	23166SI	33

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*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Methoxsalen	16103003	23167SI	37
Caelo	Methoxsalen	170781	23333SI	40
Caelo	Methoxsalen	170781	23346SI	36

- 161 523 spectra from a total of 3489 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 127 spectra from 55 *Apo-Ident* customers from 56 batches from the substance/substance group *Methoxsalen*.

- These include spectra of independent samples from 56 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Methoxsalen	1503009-01	5
Euro OTC	Methoxsalen	1506013-01	12
Caelo	Methoxsalen	1136428	1
Caelo	Methoxsalen	11376420	2
Caelo	Methoxsalen	11376428	1
Caelo	Methoxsalen	11376433	1
Caelo	Methoxsalen	11376435	1
Audor Pharma	Methoxsalen	1203009M	1
Fagron	Methoxsalen	12E02-N05	2
PHOENIX 18.02.14	Methoxsalen	1306041-01	2
Euro OTC	Methoxsalen	1306041-01	2
Caelo	Methoxsalen	1409003-01	5
Euro OTC	Methoxsalen	1409003-01	4
Caelo	Methoxsalen	1409003-02	1
Euro OTC	Methoxsalen	140900302	1
Euro OTC	Methoxsalen	1409003-02	2
Noweda	Methoxsalen	140900302	1
Fagron	Methoxsalen	14f06-b05-296500	1
Fagron	Methoxsalen	14F06-B05-296501	2
Fagron	Methoxsalen	14F06-B05-296500	1
Caelo	Methoxsalen	14F06-B05-296501	1
Phoenix	Methoxsalen	14F06-B05-296502	1
Fagron	Methoxsalen	14F06-B05-301978	1
Euro OTC	Methoxsalen	1503009-01	9
Euro OTC	Methoxsalen	150300901	2
Euroo	Methoxsalen	1503009-01	1
Euro OTC	Methoxsalen	1503009-02	4
Euro OTC	Methoxsalen	1506013-02	5

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[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Supplier	Substance	Batch	Spectra
Herbal Creations/Caesar…	Methoxsalen	15244203	1
Caelo	Methoxsalen	15244204	3
Herbal Creations/Caesar…	Methoxsalen	15244205	1
Caelo	Methoxsalen	15244205	2
Herbal creations/Caesar…	Methoxsalen	15244208	1
Herbal creations/Caesar…	Methoxsalen	15244212	1
Caelo	Methoxsalen	15244209	1
Caelo	Methoxsalen	15244216	1
Fagron	Methoxsalen	15F23-B03-318166	1
Fagron	Methoxsalen	15F23-B03-309644	1
Fagron	Methoxsalen	15C10-B99-306266	1
Euro OTC	Methoxsalen	1608019-01	1
Caelo	Methoxsalen	16/079/M	1
Euro OTC	Methoxsalen	160801902	1
Euro OTC	Methoxsalen	1608019-02	1
Sanacorp	Methoxsalen	1AKD6	1
Fagron	Methoxsalen	2111A-03262	2
Audor Pharma	Methoxsalen	AP15244213M	4
Euro OTC	Methoxsalen	1104010-01	1
Audor Pharma	Methoxsalen	APHCFMPC16011M	1
Phönix 13.05.2013	Methoxsalen	11376401	2
EuRho	Methoxsalen	1104010-01	1
Phönix/Maros	Methoxsalen	11376408	2
Caelo	Methoxsalen	11376413	2
Noweda	Methoxsalen	11D07-N16	2
Fagron	Methoxsalen	11D07-N16	1
Fagron	Methoxsalen	11F21-N02	1
Fagron	Methoxsalen	11f21-n02	1
Euro OTC	Methoxsalen	1203009-01	1
Euro OTC	Methoxsalen	1209015-01	3
Say Phytoceut. Ltd	Methoxsalen	1209015-01	4
Euro OTC	Methoxsalen	120901501	1
Fagron	Methoxsalen	12G02-N14	1
Fagron	Methoxsalen	13A10N06	1
Caelo	Methoxsalen	13c13-n06	1
Nachprüfung	Methoxsalen	4211Q-03262	1
Audor Pharma	Methoxsalen	AP1011024-01M	1
Fagron	Methoxsalen		1
Fagron	Methoxsalen	MS01/13-14	1

- 77 032 spectra from 463 *Apo-Ident* customers from a total of 25 491 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Methoxsalen* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Methoxsalen* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

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	False positive	True positive	False negative	True negative
Type A	0	240	0	72 193
Type B	0	477	73	161 523
Type C	0	126	1	77 032

The substance/substance group *Methoxsalen* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.5000 %)
Type B	100.0000 % (> 99.9928 %)	86.7273 % (> 86.1818 %)
Type C	100.0000 % (> 99.8850 %)	99.2126 % (> 96.8504 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21555	21862	5.14	87.08
21862	21862	0.00	90.64
22785	22785	0.00	88.21
23165	22785	6.10	82.05
23167	22785	7.36	80.52
23346	23346	0.00	77.47

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Methyl cellulose**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20705-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Methyl cellulose; Hypromellose 4000; Hypromellosum E4M Prem; Methylcellulosum; Methylhydroxypropylcellulosum E4M Prem

Special notes

When selecting the *Methyl cellulose* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Methyl cellulose*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Methyl cellulose	12D02-N09	20705	40	1402447
Caelo	Hypromellose 4000	13155006	20919	40	1402056
Caelo	Methyl cellulose	13130115	21570	40	20130517
Caelo	Hypromellose 4000	14338801	21702	30	20141217
Caelo	Methyl cellulose	160602	22457	40	20160323*
Fagron	Hypromellose 4000	15G08-B14-314845	22609	40	20150727

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 230 spectra of 6 reference samples from the substance/substance group *Methyl cellulose*. These samples are listed above in the section *calibration samples*. The reference samples originate from 6 different batches.

- 72 203 spectra from a total of 1576 batches from further 364 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 335 spectra from 10 reference samples of the substance/substance group *Methyl cellulose*.

- These include spectra of independent samples from 6 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Hypromellose 4000	11A27-N27	20222	40
Caelo	Methyl cellulose	10247609	20225	40
Caelo	Hypromellose 4000	13155006	20931	40
Caelo	Methyl cellulose	13130115	21570†	20
Caelo	Hypromellose 4000	14338801	21702†	15
Caelo	Methyl cellulose	160602	22457†	20
Caelo	Hypromellose 4000	162244	22757	40
Fagron	Methyl cellulose	15H04-B07-331291	23224	40
Caelo	Hypromellose 4000	171150	23284	40
Caelo	Methyl cellulose	171704	23627	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 738 spectra from a total of 3489 batches from further 862 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 276 spectra from 148 *Apo-Ident* customers from 113 batches from the substance/substance group *Methyl cellulose*.

- These include spectra of independent samples from 110 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Hypromellose 4000	12239502	1
Euro OTC	Hypromellose 4000	1306022-02	1
Fagron	Hypromellose 4000	13D03-N03	7
Caelo	Hypromellose 4000	13155004	10
Fagron	Hypromellose 4000	13E02-B03-290531	3
Fagron	Hypromellose 4000	13H09-N04	11
Caelo	Hypromellose 4000	14338801	1
Caelo	Hypromellose 4000	14338802	1
Fagron	Hypromellose 4000	14C05B03	1
Caelo	Hypromellose 4000	1438801	1
Caelo	Hypromellose 4000	14338803	1
Fagron	Hypromellose 4000	14C05-B03-294708	6
DOW Chemical Company Mi…	Hypromellose 4000	14G02-B11-296850	1
Fagron	Hypromellose 4000	14G02-B11-296850	2
Phönix Gotha	Hypromellose 4000	14G02-B11-296850	1
Fagron	Hypromellose 4000	14G02-B11-296851	1
Fagron	Hypromellose 4000	14G02-B11-302118	5
Caelo	Hypromellose 4000	15B02-B05-308852	1
Fagron	Hypromellose 4000	15B02-B05-308852	1
Fagron	Hypromellose 4000	15B02-B05	1
Fagron	Hypromellose 4000	15G08-B14-310845	6
Fagron	Hypromellose 4000	15g08-b14-310845	2
Fagron	Hypromellose 4000	15G08-B14-314845	5
Caelo	Hypromellose 4000	16224401	5
Caelo	Hypromellose 4000	16224409	1
Caelo	Hypromellose 4000	16224403	2
Caelo	Hypromellose 4000	16224407	2
Fagron	Hypromellose 4000	16B16B07	1
FRAGON/Poenix	Hypromellose 4000	16B16-B07-18276	1
Fagron	Hypromellose 4000	16B16-B07-318531	5
Fagron	Hypromellose 4000	16B16-B07-321327	2
Fagron	Hypromellose 4000	16H23-B02-332066	4
Fagron	Hypromellose 4000	16B16-B07-323114	1
Fagron	Hypromellose 4000	700182-0001	1
Fagron	Hypromellose 4000	1K01012N11	1
Fagron	Hypromellose 4000	11H26-N01	1
Caelo	Hypromellose 4000	12098702	1
Kehr	Hypromellose 4000	12098704	1

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Supplier	Substance	Batch	Spectra
Fagron	Hypromellose 4000	12A30-N02	3
Caelo	Hypromellose 4000	12215504	2
Fagron	Hypromellose 4000	12G23-N03	2
Fagron	Hypromellose 4000	12E02-N03	3
Caelo	Hypromellose 4000	13100304	3
Caelo	Hypromellose 4000	13155005	1
Noweda	Hypromellose 4000	1315505	1
Fagron	Hypromellose 4000	13D03N03	1
Fagron	Hypromellose 4000	1J31012N11	3
Caelo	Hypromellose 4000	ZH19012N12	2
Fagron	Hypromellose 4000	ZH19012N12	2
Fagron	Hypromellose 4000	10G09-N03	1
Fagron	Hypromellose 4000	13E02-B03-290532	1
Caelo	Methyl cellulose	5081404	1
Fagron	Methyl cellulose	12H06-N06	2
Fagron	Methyl cellulose	13/26-N04	1
Caelo	Methyl cellulose	12L05-N03	1
Fagron	Methyl cellulose	131301(09)	1
Caelo	Methyl cellulose	13130104	5
Caelo	Methyl cellulose	13130109	5
Caelo	Methyl cellulose	13130115	6
Caelo	Methyl cellulose	13130121	3
Fagron	Methyl cellulose	13E02-B03-290531	1
Caelo	Methyl cellulose	14197502	5
Caelo	Methyl cellulose	14197513	1
Vdl nachliefer; 2.7.15;...	Methyl cellulose	14197502	1
Caelo	Methyl cellulose	14197514	7
Caelo	Methyl cellulose	15179602	10
Euro OTC	Methyl cellulose	15179602	1
Caelo	Methyl cellulose	15179605	7
Caelo	Methyl cellulose	16060206	6
Fagron	Methyl cellulose	15G08B14314845	1
Caelo	Methyl cellulose	16060202	1
Caelo	Methyl cellulose	16060210	5
Caelo	Methyl cellulose	12044931	2
Caelo	Methyl cellulose	13021401	1
Caelo	Methyl cellulose	13130102	1
Caelo	Methyl cellulose	20021401	1
Euro OTC	Methyl cellulose	10247609	1
Caelo	Methyl cellulose	10247604	1
Caelo	Methyl cellulose	11127303	1
Caelo	Methyl cellulose	11127314	1
Fagron	Methyl cellulose	11G15-N08	1
Caelo	Methyl cellulose	12044903	3
Caelo	Methyl cellulose	12044907	2
Caelo	Methyl cellulose	12044917	1
Caelo	Methyl cellulose	12044918	2
Caelo	Methyl cellulose	12044922	3
Euro OTC	Methyl cellulose	12044927	1
Caesar & Loretz GmbH	Methyl cellulose	12044922	1
Caelo	Methyl cellulose	12044927	6
Nachprüfung 2609	Hypromellose 4000	11H26-N01	1
Fagron	Hypromellose 4000	14G02-B11	3
Gehe	Hypromellose 4000	14G02-B11	1
Fagron	Hypromellose 4000	14g02-b11-302118	2
Fagron	Hypromellose 4000	14G02-B11-302121	1
Fagron	Hypromellose 4000	15G08-B14	1
Jenne	Hypromellose 4000	15G08-B14	1
Fagron	Hypromellose 4000	15G08B14314185	2
Fagron	Hypromellose 4000	15g08-b14-314845	1

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Supplier	Substance	Batch	Spectra
Phönix	Hypromellose 4000	16224403	1
Phoenix	Hypromellose 4000	16B16-B07	1
Fagron	Hypromellose 4000	16B16-B07-318276	1
Fagron	Hypromellose 4000	16B-16-B07-321327	1
Fagron	Hypromellose 4000	16B16-B07-321328	1
Fagron	Hypromellose 4000	16B16-B07-321579	1
Fagron	Hypromellose 4000	3G08012N11	1
Fagron	Hypromellose 4000	D180F8Q011	1
Caelo	Hypromellose 4000	D180F8Q011	1
Gehe / 26.10.12 Fragon	Hypromellose 4000	9D30-N05	1
Gehe	Hypromellose 4000	11D15-N06	1
Anzag am 03.05.2012	Hypromellose 4000	11H26-N01	1
Fagron	Hypromellose 4000	12D03-N03	1
Gehe	Hypromellose 4000	12E02-N03	1
anzag, 21.11.2012	Hypromellose 4000	12E02-N03	3
Fagron	Hypromellose 4000	12G23-N03	1
Fagron	Hypromellose 4000	12H20-N05	1
Caelo	Hypromellose 4000	13155002	1
Caelo	Hypromellose 4000	13d03-n03	1
Caelo	Hypromellose 4000	13D03-N03	1
Alliance Health 27.12.2…	Hypromellose 4000	13D03-N03	1
Fagron	Hypromellose 4000	13h09-m04	1
Phoenix	Hypromellose 4000	13E02-B03	1
Phonix	Hypromellose 4000	13H09-N04	1
Fagron	Hypromellose 4000	14C05-B03	1
Gatt-Koller / Phoenix	Hypromellose 4000	14C05-B03-291647	2
Phoenix	Hypromellose 4000	14c05-b03-294708	1
Fagron	Hypromellose 4000	1A01012N11	1
Fagron	Hypromellose 4000	20110612-2	1
Fagron	Hypromellose 4000	YI16012N11	1
Fagron	Hypromellose 4000	13H08-N04	2
Fagron	Hypromellose 4000	14c05-B03-294708	1
Caelo	Hypromellose 4000	14C05-B03-294708	1
Fagron	Hypromellose 4000	14C05-B03-294711	1
Fagron	Hypromellose 4000	2H12012N12	1

- 76 883 spectra from 463 *Apo-Ident* customers from a total of 25 436 batches from a further 699 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Methyl cellulose* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Methyl cellulose* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	230	0	72 203
Type B	0	333	2	161 738
Type C	0	262	14	76 883

The substance/substance group *Methyl cellulose* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.3913 %)
Type B	100.0000 % (> 99.9928 %)	99.4030 % (> 98.5075 %)
Type C	100.0000 % (> 99.8850 %)	94.9275 % (> 93.8406 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20705	20705	0.00	27.81
20919	20919	0.00	50.53
21570	20705	10.86	31.11
21702	20919	7.02	52.34
22457	22457	0.00	35.00
22609	20705	10.89	40.86

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Methyl-4-hydroxybenzoate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20345-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Methyl-4-hydroxybenzoate; Methylis parahydroxybenzoas; Methylium parahydroxybenzoicum

Special notes

When selecting the *Methyl-4-hydroxybenzoate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Methyl-4-hydroxybenzoate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Methyl-4-hydroxy…	11090034	20693	40	20110428
Euro OTC	Methyl-4-hydroxy…	1205025-01	20697	40	20120601
Euro OTC	Methyl-4-hydroxy…	1601037	22305	40	20160119*
Fagron	Methyl-4-hydroxy…	14L30-T01-018345	23223	40	20150309

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 4 reference samples from the substance/substance group *Methyl-4-hydroxybenzoate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 4 different batches.

- 72 273 spectra from a total of 1578 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 320 spectra from 8 reference samples of the substance/substance group *Methyl-4-hydroxybenzoate*.

- These include spectra of independent samples from 7 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Methyl-4-hydroxybenzoate	10039706	20134	40
Caelo	Methyl-4-hydroxybenzoate	09344712	20345	40
Caelo	Methyl-4-hydroxybenzoate	11090031	20505	40
Caelo	Methyl-4-hydroxybenzoate	13268813	21439	60
Euro OTC	Methyl-4-hydroxybenzoate	1601037	22305†	20
Caelo	Methyl-4-hydroxybenzoate	15063820	23216	40
Caelo	Methyl-4-hydroxybenzoate	171581	23317	40
Euro OTC	Methyl-4-hydroxybenzoate	1706005	23703	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 753 spectra from a total of 3491 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 219 spectra from 131 *Apo-Ident* customers from 88 batches from the substance/substance group *Methyl-4-hydroxybenzoate*.

- These include spectra of independent samples from 87 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Methyl-4-hydroxybenzoate	13268809	8
EuRho	Methyl-4-hydroxybenzoate	110403101	1
Caelo	Methyl-4-hydroxybenzoate	6091402	1
Caelo	Methyl-4-hydroxybenzoate	11090031	5
Caelo	Methyl-4-hydroxybenzoate	12251624	7
Caelo	Methyl-4-hydroxybenzoate	12081502	1
Caelo	Methyl-4-hydroxybenzoate	13268802	2
Caelo	Methyl-4-hydroxybenzoate	13268803	1
Caelo	Methyl-4-hydroxybenzoate	13268804	8
Caesar & Loretz GmbH	Methyl-4-hydroxybenzoate	13268809	1
Caelo	Methyl-4-hydroxybenzoate	13268813	8
Caelo	Methyl-4-hydroxybenzoate	13268821	2
Caelo	Methyl-4-hydroxybenzoate	13268819	1
Euro OTC	Methyl-4-hydroxybenzoate	1401027-01	1
Euro OTC	Methyl-4-hydroxybenzoate	1401027-02	2
Euro OTC	Methyl-4-hydroxybenzoate	140600501	1
Caelo	Methyl-4-hydroxybenzoate	14120208	5
Euro OTC	Methyl-4-hydroxybenzoate	1406005-01	1
Euro OTC	Methyl-4-hydroxybenzoate	1502009-01	7
Caelo	Methyl-4-hydroxybenzoate	15063802	6
Caelo	Methyl-4-hydroxybenzoate	15063803	1
Caelo	Methyl-4-hydroxybenzoate	15063806	7
Caesar/Noweda	Methyl-4-hydroxybenzoate	15063806	1
Caelo	Methyl-4-hydroxybenzoate	15063813	2
Caelo	Methyl-4-hydroxybenzoate	15063818	1
PHÖNIX	Methyl-4-hydroxybenzoate	15063819	1
Caelo	Methyl-4-hydroxybenzoate	15063819	1
Caelo	Methyl-4-hydroxybenzoate	15063820	3
Euro OTC	Methyl-4-hydroxybenzoate	1507042-01	10
Euro OTC	Methyl-4-hydroxybenzoate	1507042-02	1
Caelo	Methyl-4-hydroxybenzoate	15222203	3
Caelo	Methyl-4-hydroxybenzoate	15298101	1
Caelo	Methyl-4-hydroxybenzoate	15298102	12
Sanacorp	Methyl-4-hydroxybenzoate	15298102	1
Caelo	Methyl-4-hydroxybenzoate	15444916	1
Caelo	Methyl-4-hydroxybenzoate	15444911	1
Euro OTC	Methyl-4-hydroxybenzoate	1601037-01	6
Caelo	Methyl-4-hydroxybenzoate	16256103	2
Caelo	Methyl-4-hydroxybenzoate	16256118	2
Fagron	Methyl-4-hydroxybenzoate	16256115	1

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Supplier	Substance	Batch	Spectra
Caelo	Methyl-4-hydroxybenzoate	17158101	1
Phönix	Methyl-4-hydroxybenzoate	2AKD3	1
Caelo	Methyl-4-hydroxybenzoate	413051/1	1
Euro OTC	Methyl-4-hydroxybenzoate	3115M-01930	1
Euro OTC	Methyl-4-hydroxybenzoate	4314U-01930	1
Euro OTC	Methyl-4-hydroxybenzoate	4312I-01930	1
GATT-KOLLER/PHOENIX	Methyl-4-hydroxybenzoate	6112/01142814	1
Caelo	Methyl-4-hydroxybenzoate	713Q-01930	1
Caelo	Methyl-4-hydroxybenzoate	8121-01930	1
Caelo	Methyl-4-hydroxybenzoate	9011303	1
Fagron	Methyl-4-hydroxybenzoate		2
Caelo	Methyl-4-hydroxybenzoate	10039706	1
Euro OTC	Methyl-4-hydroxybenzoate	1009022-01	2
Eigenherstellung	Methyl-4-hydroxybenzoate	100912PML01	1
Caelo	Methyl-4-hydroxybenzoate	10113609	1
Caelo	Methyl-4-hydroxybenzoate	1108211930	1
Caelo	Methyl-4-hydroxybenzoate	110900029	1
Caelo	Methyl-4-hydroxybenzoate	11090003	1
Gehe	Methyl-4-hydroxybenzoate	11090020	1
Caelo	Methyl-4-hydroxybenzoate	11090030	3
Gehe	Methyl-4-hydroxybenzoate	11090031	1
Caelo	Methyl-4-hydroxybenzoate	11345115	10
Post-Apotheke	Methyl-4-hydroxybenzoate	1110033-01	1
Caelo	Methyl-4-hydroxybenzoate	111003301	1
Anzag	Methyl-4-hydroxybenzoate	11345115	1
Euro OTC	Methyl-4-hydroxybenzoate	1110033-01	1
Noweda	Methyl-4-hydroxybenzoate	11345115	1
Caelo	Methyl-4-hydroxybenzoate	11345120	5
Caelo	Methyl-4-hydroxybenzoate	12042202	1
phönix,13.12.2012	Methyl-4-hydroxybenzoate	1205025-01	1
Euro OTC	Methyl-4-hydroxybenzoate	1212011-01	4
Caelo	Methyl-4-hydroxybenzoate	12251605	5
Caelo	Methyl-4-hydroxybenzoate	12251611	1
Bombastus	Methyl-4-hydroxybenzoate	1212011-01	1
AHD	Methyl-4-hydroxybenzoate	12251624	1
Phönix 14.01.2014	Methyl-4-hydroxybenzoate	12251624	1
PHOENIX am 15.01.2014	Methyl-4-hydroxybenzoate	12251624	1
Caelo	Methyl-4-hydroxybenzoate	1251624	1
Fagron	Methyl-4-hydroxybenzoate	12H02-N08	2
Fagron	Methyl-4-hydroxybenzoate	12D18-N01	1
Caelo	Methyl-4-hydroxybenzoate	13081308	1
Caesar&loretz,Phoenix	Methyl-4-hydroxybenzoate	13268821	1
Fagron	Methyl-4-hydroxybenzoate	13B25-N03	2
Fagron	Methyl-4-hydroxybenzoate	13E27-N09	1
Euro OTC	Methyl-4-hydroxybenzoate	172620	1
Anzag/	Methyl-4-hydroxybenzoate	201111251	1
Euro OTC	Methyl-4-hydroxybenzoate	2606022	1
Caelo	Methyl-4-hydroxybenzoate	290114PML01	1
Fagron	Methyl-4-hydroxybenzoate	20111125-1	1
Caelo	Methyl-4-hydroxybenzoate	14120210	1
Sanacorp, 12.08.2016, 4...	Methyl-4-hydroxybenzoate	15298102	1
Noweda	Methyl-4-hydroxybenzoate	11090002	2
Noweda	Methyl-4-hydroxybenzoate	11090021	1
Caelo	Methyl-4-hydroxybenzoate	12251619	2
Fagron	Methyl-4-hydroxybenzoate	12D18N01	1
Caelo	Methyl-4-hydroxybenzoate	13268815	1
Euro OTC	Methyl-4-hydroxybenzoate	120502501	1
Dorfmeister	Methyl-4-hydroxybenzoate	1212011-01	1
Noweda	Methyl-4-hydroxybenzoate	21022111/1	1
Caelo	Methyl-4-hydroxybenzoate	1225164	1

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Supplier	Substance	Batch	Spectra
Noweda	Methyl-4-hydroxybenzoate	10113607	1
Noweda	Methyl-4-hydroxybenzoate	11090010	1
Noweda	Methyl-4-hydroxybenzoate	11090030	1
phönix 4.12.2013	Methyl-4-hydroxybenzoate	1212011/01	1

- 76 940 spectra from 463 *Apo-Ident* customers from a total of 25 461 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Methyl-4-hydroxybenzoate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Methyl-4-hydroxybenzoate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	72 273
Type B	0	310	10	161 753
Type C	0	214	5	76 940

The substance/substance group *Methyl-4-hydroxybenzoate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9928 %)	96.8750 % (> 95.9375 %)
Type C	100.0000 % (> 99.8850 %)	97.7169 % (> 96.3470 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20693	22305	6.83	47.82
20697	22305	6.21	47.70
22305	22305	0.00	47.30
23223	22305	8.01	46.99

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Methylcobalamin**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20743-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Methylcobalamin

Special notes

When selecting the *Methylcobalamin* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Methylcobalamin*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Methylcobalamin	1207019-01	20743	40	1402501
Euro OTC	Methylcobalamin	1401032-01	21721	40	8778
Euro OTC	Methylcobalamin	1510002	22234	40	20151201*
Euro OTC	Methylcobalamin	1401032	22239	40	20151201*
Euro OTC	Methylcobalamin	1601043	22379	40	20160209*
Euro OTC	Methylcobalamin	1804006	24072	40	20180420*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 240 spectra of 6 reference samples from the substance/substance group *Methylcobalamin*. These samples are listed above in the section *calibration samples*. The reference samples originate from 6 different batches.

- 72 193 spectra from a total of 1576 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 160 spectra from 6 reference samples of the substance/substance group *Methylcobalamin*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Hebei Welcome Pharmaceu…	Methylcobalamin	03090510	20438	40
Euro OTC	Methylcobalamin	1401032-01	21721†	20
Euro OTC	Methylcobalamin	1510002	22234†	20
Euro OTC	Methylcobalamin	1401032	22239†	20
Euro OTC	Methylcobalamin	1601043	22379†	20
Euro OTC	Methylcobalamin	1711031	23885	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 913 spectra from a total of 3493 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 4 spectra from 2 *Apo-Ident* customers from 4 batches from the substance/substance group *Methylcobalamin*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Euro OTC	Methylcobalamin	1409017-01	1
Euro OTC	Methylcobalamin	1207019-01	1
Euro OTC	Methylcobalamin	1310014-01	1
Euro OTC	Methylcobalamin	Ch1207019-01	1

- 77 155 spectra from 463 *Apo-Ident* customers from a total of 25 543 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Methylcobalamin* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Methylcobalamin* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	240	0	72 193
Type B	0	108	52	161 913
Type C	0	3	1	77 155

The substance/substance group *Methylcobalamin* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.5000 %)
Type B	100.0000 % (> 99.9928 %)	67.5000 % (> 65.6250 %)
Type C	100.0000 % (> 99.8853 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several

new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20743	20743	0.00	28.65
21721	21721	0.00	16.18
22234	22234	0.00	27.39
22239	22239	0.00	29.79
22379	22379	0.00	24.81
24072	24072	0.00	21.43

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Methylprednisolone**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20953-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Methylprednisolone; Methylprednisolonum

Special notes

When selecting the *Methylprednisolone* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Methylprednisolone*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Methylprednisolone	13G19-N05	20953	40	1402438
Fagron	Methylprednisolone	15I04-B05-311572	22275	30	AR-16-FG-009102-01
Fagron	Methylprednisolone	15I04-B05-311572	22354	30	20151026
Fagron	Methylprednisolone	15I04-B05-311572	22275SI	30	AR-16-FG-009102-01
Fagron	Methylprednisolone	15I04-B05-311572	22354SI	30	20151026

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 5 reference samples from the substance/substance group *Methylprednisolone*. These samples are listed above in the section *calibration samples*. The reference samples originate from 2 different batches.

- 72 273 spectra from a total of 1580 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 250 spectra from 9 reference samples of the substance/substance group *Methylprednisolone*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Methylprednisolone	12D17-N04	20650	40
Fagron	Methylprednisolone	15I04-B05-311572	22275†	15
Fagron	Methylprednisolone	15I04-B05-311572	22354†	15
Fagron	Methylprednisolone	15L15-B01-321887	23229	40
Fagron	Methylprednisolone	18A03-B05-345742	23997	40
Fagron	Methylprednisolone	15I04-B05-311572	22275SI†	15
Fagron	Methylprednisolone	15I04-B05-311572	22354SI†	15
Fagron	Methylprednisolone	15L15-B01-321887	23229SI	30
Fagron	Methylprednisolone	18A03-B05-345742	23997SI	40

- 161 823 spectra from a total of 3495 batches from further 863 substances. These spectra were

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 1 spectra from 1 *Apo-Ident* customers from 1 batches from the substance/substance group *Methylprednisolone*.

- These include spectra of independent samples from 1 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Methylprednisolone	12D17-N04	1

- 77 158 spectra from 463 *Apo-Ident* customers from a total of 25 546 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Methylprednisolone* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Methylprednisolone* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	72 273
Type B	0	242	8	161 823
Type C	0	1	0	77 158

The substance/substance group *Methylprednisolone* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9928 %)	96.8000 % (> 95.6000 %)
Type C	100.0000 % (> 99.8862 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to

exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20953	20953	0.00	28.63
22275	22275	0.00	31.40
22354	22275	3.02	31.97

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Metoprolol tartrate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	21753-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Metoprolol tartrate; Metoprololi tartras

Special notes

When selecting the *Metoprolol tartrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Metoprolol tartrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Inresa	Metoprolol tartr…	309905RII	21753	40	AR-15-FG-006635-01
Inresa	Metoprolol tartr…	405005RII	21805	40	20140430
Fagron	Metoprolol tartr…	16E31-B03-327107	22944	40	20160627

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Metoprolol tartrate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 183 spectra from 6 reference samples of the substance/substance group *Metoprolol tartrate*.

- These include spectra of independent samples from 1 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Inresa	Metoprolol tartrate	309905RII	21753†	20
Inresa	Metoprolol tartrate	405005RII	21805†	20
Inresa	Metoprolol tartrate	405005RIIC/29082016	22908	40
Fagron	Metoprolol tartrate	16E31-B03-327107	22927	40
Fagron	Metoprolol tartrate	16E31-B03-327107	22943	40
Fagron	Metoprolol tartrate	16E31-B03-327107	not required	23

- 161 890 spectra from a total of 3495 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 11 spectra from 6 *Apo-Ident* customers from 8 batches from the substance/substance group *Metoprolol tartrate*.

- These include spectra of independent samples from 8 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Antares	Metoprolol tartrate	1014Q-07308	1
Fagron	Metoprolol tartrate	17G03-B09-340197	1
Inresa	Metoprolol tartrate	4050005RIIB	1
Inresa	Metoprolol tartrate	504005RIIC/29082016	1
Th. Geyer	Metoprolol tartrate	56392-17-7	1
Andor	Metoprolol tartrate	APMTP0117MT	1
Sigma-Aldrich GmbH	Metoprolol tartrate	LRAA6905	4
Sigma Adrich/Alliance H.	Metoprolol tartrate	PHR1076	1

- 77 148 spectra from 463 *Apo-Ident* customers from a total of 25 539 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Metoprolol tartrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Metoprolol tartrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	183	0	161 890
Type C	0	7	4	77 148

The substance/substance group *Metoprolol tartrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 96.7213 %)
Type C	100.0000 % (> 99.8851 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to

exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21753	21753	0.00	58.97
21805	21753	2.73	57.69
22944	21753	13.59	66.50

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Metronidazole**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20001-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Metronidazole; Metronidazolum

Special notes

When selecting the *Metronidazole* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Metronidazole*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Metronidazole	12110410	20857	40	20120515
Fagron	Metronidazole	13D10-N02	21212	40	20130516
Euro OTC	Metronidazole	1212030-02	21213	40	20130627
Caelo	Metronidazole	13095007	21356	40	20130426
Euro OTC	Metronidazole	1508004	21881	40	20150819*
Caelo	Metronidazole	160892	22472	40	20160413*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 240 spectra of 6 reference samples from the substance/substance group *Metronidazole*. These samples are listed above in the section *calibration samples*. The reference samples originate from 6 different batches.

- 72 193 spectra from a total of 1576 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 450 spectra from 13 reference samples of the substance/substance group *Metronidazole*.

- These include spectra of independent samples from 10 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Metronidazole	81604189	20001	30
Caelo	Metronidazole	13095005	21214	40
Caelo	Metronidazole	13095007	21360	40
Euro OTC	Metronidazole	1508004	21881†	20
Caelo	Metronidazole	160892	22472†	20
Euro OTC	Metronidazole	1609028	22751	40
Fagron	Metronidazole	16I19-B04-326155	22835	40
Euro OTC	Metronidazole	1612013	22917	40
Euro OTC	Metronidazole	1701039	23132	40
Euro OTC	Metronidazole	1707008	23542	30
Euro OTC	Metronidazole	1706022	23550	30
Caelo	Metronidazole	172905	23808	40
Euro OTC	Metronidazole	1802007	23946	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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- 161 623 spectra from a total of 3486 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 1568 spectra from 354 *Apo-Ident* customers from 398 batches from the substance/substance group *Metronidazole*.

- These include spectra of independent samples from 388 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Euro OTC	Metronidazole	1307042-01	7
Fagron	Metronidazole	1220141155F	2
Gatt-Koller	Metronidazole	497/03151515	1
Gatt-Koller	Metronidazole	497/03151015	1
Caelo	Metronidazole	2022015B	1
Gatt-Koller	Metronidazole	497/03154015	1
Caelo	Metronidazole	7071405	1
Caelo	Metronidazole	7031401	1
Caelo	Metronidazole	9715621	1
Euro OTC	Metronidazole	10800401	1
Caelo	Metronidazole	113214021	1
Caelo	Metronidazole	11F15-N07	1
Caelo	Metronidazole	12081507	1
Caelo	Metronidazole	12091403	1
Euro OTC	Metronidazole	121001-02	3
Euro OTC	Metronidazole	1212001-02	17
Euro OTC	Metronidazole	121030-01	1
Corden Pharma	Metronidazole	1212001-02	2
Gehe am 04.02.14	Metronidazole	1212030-01	2
Euro OTC	Metronidazole	1212030-02	8
Caelo	Metronidazole	1212030-01	2
Dorfmeister	Metronidazole	1212030-02	1
Caelo	Metronidazole	1212030-21	1
Fagron	Metronidazole	12A20-B07-303298	1
Caelo	Metronidazole	12339521	1
Fagron	Metronidazole	12f15-n04	1
Fagron	Metronidazole	12G04-N15	19
Fagron	Metronidazole	12L17-N11	16
Fagron	Metronidazole	12L17-N16	3
Fagron	Metronidazole	13/21-N07	2
Fagron	Metronidazole	13/21-N7	2
Caelo	Metronidazole	13041503	1
Euro OTC	Metronidazole	13070002-02	1
Caelo	Metronidazole	1307002	1
Euro OTC	Metronidazole	1307002-01	9

continued on the next page

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Supplier	Substance	Batch	Spectra
GEHE 11.06.2014	Metronidazole	1307002-01	1
Gehe	Metronidazole	1307002-01	1
EuRho/Phönix	Metronidazole	1307002-01	1
Kuerzel	Metronidazole	1307002-02	1
Gehe	Metronidazole	1307002-02	1
Caelo	Metronidazole	1307002-02	1
Euro OTC	Metronidazole	1307002-02	1
Fagron	Metronidazole	1307042	1
Caelo	Metronidazole	1307042-01	1
Alliance Health 20.05.2...	Metronidazole	1307042-01	2
Euro OTC	Metronidazole	1307042-02	8
Caelo	Metronidazole	13095002	8
Sanacorp	Metronidazole	13095002	1
Fagron	Metronidazole	13095002	1
Caelo	Metronidazole	13095003	16
Cealo/Sanacorp	Metronidazole	13095003	1
Caelo	Metronidazole	13095004	12
Caelo	Metronidazole	13095005	8
Caelo	Metronidazole	13095006	8
Ichthyol Gesellschaft	Metronidazole	13095005	1
Anzag 21.10.14 EK 2.85	Metronidazole	13095007	1
Caelo	Metronidazole	13095007	9
Caelo	Metronidazole	13095011	3
Caelo	Metronidazole	13095012	13
Noweda	Metronidazole	13095012	1
Caelo	Metronidazole	13095013	13
AHD 22.09.14 EK 4,52	Metronidazole	13095013	1
Caesar & Lorenz	Metronidazole	13095013	1
Caelo	Metronidazole	13095017	8
Caelo	Metronidazole	13095018	6
Caelo	Metronidazole	13095019	8
Caelo	Metronidazole	13095020	7
Caelo	Metronidazole	13214001	15
VDL 07.11.14	Metronidazole	13214001	1
Caelo	Metronidazole	13214002	20
Caelo	Metronidazole	132140022	1
Caelo	Metronidazole	13214003	13
Caelo	Metronidazole	13214009	6
Sanacorp 02.03.15	Metronidazole	13214009	1
Caelo	Metronidazole	13214010	5
Caelo	Metronidazole	13214011	1
Caelo	Metronidazole	13214012	5
Caelo	Metronidazole	13214013	1
Caelo	Metronidazole	13214014	7
Caesar & Loretz GmbH Hi...	Metronidazole	13214013	1
Caelo	Metronidazole	13214015	7
Caelo	Metronidazole	13214016	2
Caelo	Metronidazole	13214017	5
Phönix	Metronidazole	13214017	1
Phönix Gotha	Metronidazole	13214017	1
Noweda/Wepa	Metronidazole	13214017	1
Caelo	Metronidazole	13214018	5
Bombastus	Metronidazole	13214018	1
Caelo	Metronidazole	13214019	8
Caelo	Metronidazole	13214021	1
Caelo	Metronidazole	13214024	3
Caelo	Metronidazole	13214025	6
Noweda	Metronidazole	13214025	1
Caelo	Metronidazole	13214029	8
Anzag/Henry Lamotte	Metronidazole	13214029	1

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Supplier	Substance	Batch	Spectra
Caelo	Metronidazole	1321409	1
Fagron	Metronidazole	13D10-N02	4
Fagron	Metronidazole	13I10-N03	3
Fagron	Metronidazole	13J21-N07	37
Fagron	Metronidazole	13J21N07	3
Fagron	Metronidazole	13j21-n07	3
Caelo	Metronidazole	13J21-N07	1
Fagron	Metronidazole	13j21-N07	1
Euro OTC	Metronidazole	1406010-01	21
EuRho	Metronidazole	1406010-01	1
Euro OTC	Metronidazole	140601001	2
Pphoenix goettin	Metronidazole	1406010-01	1
Eurho	Metronidazole	1406010-01	1
Eurimpharm	Metronidazole	140601001	1
Euro OTC	Metronidazole		1
Euro OTC	Metronidazole	1407003	1
Euro OTC	Metronidazole	1407003-01	8
Euro OTC	Metronidazole	140700301	1
Noweda	Metronidazole	1407003-01	2
Euro OTC	Metronidazole	140700302	2
Euro OTC	Metronidazole	1407003-02	5
Euro OTC	Metronidazole	1412016-01	13
Caelo	Metronidazole	1412016-01	4
Euro OTC	Metronidazole	1412016-02	21
Euro OTC	Metronidazole	141201601	1
Caelo	Metronidazole	1412016-02	1
Fagron	Metronidazole	1414-B02-291237	1
Fagron	Metronidazole	141C14-B02-296437	1
Farchemia Srl/Sanacorp	Metronidazole	146010-01	1
Caelo	Metronidazole	14b27-b31-291230	1
Fagron	Metronidazole	14B27-B31-291230	1
Fagron	Metronidazole	14B27-B31-291234	1
Fagron	Metronidazole	14B27-B31-291235	1
Fagron	Metronidazole	14B-B02-291275	1
Fagron	Metronidazole	14C14B02-291276	2
Fagron	Metronidazole	14C14-802-291237	1
Fagron	Metronidazole	14C14-B01	1
Caelo	Metronidazole	14c14-b01-295545	1
Fagron	Metronidazole	14c14-B01-295545	1
Fagron	Metronidazole	14C14-B01-295548	1
Fagron	Metronidazole	14C14-B01-306363	4
Fagron	Metronidazole	14C14-B01-309058	2
Fagron	Metronidazole	14C14B02	3
Fagron	Metronidazole	14C14-B02	6
Fagron	Metronidazole	14c14-b02-21238	1
Fagron	Metronidazole	14C14-B02-2911239	1
Fagron	Metronidazole	14C14-B02-291237	9
Caelo	Metronidazole	14C14-B02-291237	2
Fagron	Metronidazole	14C14-B02-291238	2
Fargon	Metronidazole	14c14-b02-291238	1
Fagron	Metronidazole	14C14-B02-291239	7
Fagron	Metronidazole	14c14-b02-291239	1
Caelo	Metronidazole	14C14-B02-291239	1
Fagron	Metronidazole	14C14-B02-291241	1
Fagron	Metronidazole	14C14-B02-291275	6
Fagron	Metronidazole	14c14-b02-291275	1
Fagron	Metronidazole	14C14-B02-291276	3
anzag	Metronidazole	14C14-B02-291276	2
Fagron	Metronidazole	14c14b02291276	1
Fagron	Metronidazole	14c14-b02-291276	2

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Supplier	Substance	Batch	Spectra
Fagron	Metronidazole	14C14-B02-295603	1
Caelo	Metronidazole	14C14-B02-291276	1
Fagron	Metronidazole	14C14-B02-296437	8
Fagron	Metronidazole	14-C14-B02-296437	1
Bombastus	Metronidazole	14C14-B02-296437	1
Fagron	Metronidazole	14C14-B02-300182	3
Fagron	Metronidazole	14C14-B291237	1
Gehe01/2018	Metronidazole	14C14-B02-291237	1
Fagron	Metronidazole	14C14-Bo2-291276	1
Fagron	Metronidazole		1
Euro OTC	Metronidazole	1503004-01	1
Euro OTC	Metronidazole	1505024	1
Euro OTC	Metronidazole	1505024-01	9
Euro OTC	Metronidazole	150502401	1
Euro OTC	Metronidazole	1505024-02	4
Euro OTC	Metronidazole	150502402	1
Euro OTC	Metronidazole	1505024-03	2
Euro OTC	Metronidazole	1508004-01	19
Noweda	Metronidazole	1505024-03	1
Caelo	Metronidazole	1508004-01	1
Euro OTC	Metronidazole	1508004-02	9
Euro/ Sanacorp	Metronidazole	150800402	1
Euro OTC	Metronidazole	150804-01	1
Caelo	Metronidazole	1521503	1
Caelo	Metronidazole	1508004-02	1
Caelo	Metronidazole	15215103	4
Caelo	Metronidazole	15215104	7
Caelo	Metronidazole	15215105	2
Caelo	Metronidazole	15215106	5
Caelo	Metronidazole	15215108	7
Caelo	Metronidazole	15215107	1
Caelo	Metronidazole	1523006	1
Caelo	Metronidazole	1523013	1
Caelo	Metronidazole	1523017	2
Caelo	Metronidazole	1523026	1
Caelo	Metronidazole	15253001	10
Caelo	Metronidazole	15253002	2
Caelo	Metronidazole	15253003	8
Caesar&Loretz GmbH/Sana...	Metronidazole	15253003	1
Caelo	Metronidazole	15253004	10
Caelo	Metronidazole	15253005	2
Caelo	Metronidazole	15253006	7
Caelo	Metronidazole	15253007	9
	Metronidazole	15253007	2
Caelo	Metronidazole	15253011	10
Caelo	Metronidazole	15253013	8
Caelo	Metronidazole	15253015	11
Caelo	Metronidazole	15253016	7
Caesar & Loretz GmbH Hi...	Metronidazole	15253016	1
Caelo	Metronidazole	15253017	10
Caesar & Loretz GmbH	Metronidazole	15253017	1
Caelo	Metronidazole	15253018	5
Phönix	Metronidazole	15253018	1
Caelo	Metronidazole	15253019	2
Caelo	Metronidazole	15253020	7
Caelo	Metronidazole	15253021	5
Caelo	Metronidazole	15253024	6
Caelo	Metronidazole	15253022	1
Caelo	Metronidazole	15253026	11
phönix	Metronidazole	15253026	1

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Supplier	Substance	Batch	Spectra
Caelo	Metronidazole	15253027	10
Euro OTC	Metronidazole	15253027	1
Phoenix 12.10.2016 6,63EUR	Metronidazole	15253027	1
Caelo	Metronidazole	15253028	4
Caelo	Metronidazole	15253029	2
sanacorp, 9,51EUR, 14.09....	Metronidazole	15253029	1
Bombastus	Metronidazole	15253032	1
Farchemia S.R.L./ Caesa...	Metronidazole	15253032	1
Caelo	Metronidazole	15253032	3
Caelo	Metronidazole	15253033	3
Fagron	Metronidazole	15A20-B07	1
Fagron	Metronidazole	15A20-B07-303293	7
Fagron	Metronidazole	15A20-B07-303294	2
Euro OTC	Metronidazole	15a20-b07-303294	1
Fagron	Metronidazole	15A20-B07-303294Mg	1
Fagron	Metronidazole	15A20-B07-303295	2
Caelo	Metronidazole	15A20-B07-303297	1
Fagron	Metronidazole	15A20-B07-303298	6
Fagron	Metronidazole	15A20-B07-308196	4
Caelo	Metronidazole	15A20-B07-303298	1
Fagron	Metronidazole	15a20-b07-308196	1
Fagron	Metronidazole	15A20-B07-308525	6
Fischer/Gehe	Metronidazole	15A20-B07-308525	1
Fagron	Metronidazole	15A20B07308525	1
Fagron	Metronidazole	15A20-B07-308791	3
Fagron	Metronidazole	15a20-b07-308791	1
Fagron	Metronidazole	15A20-B07-312057	4
Fagron	Metronidazole	15A20-B07312057	1
Fagron	Metronidazole	15A20-B07-312225	3
Fagron	Metronidazole	15A20-B07-31225	1
Fagron	Metronidazole	16/19-B04	1
Fagron	Metronidazole	16/19-B04-326152	2
Fagron	Metronidazole	16/19-B04-326150	1
Fagron	Metronidazole	16/19-B04-326154	1
Caelo	Metronidazole	16/19-B04-326155	1
Fagron	Metronidazole	16/19-B04-326155	2
Fagron	Metronidazole	16/19-B04-329168	2
Fagron	Metronidazole	16/19-b04-329168	1
Fagron	Metronidazole	16/19bo4326155	1
Caelo	Metronidazole	16089123	1
Phoenix	Metronidazole	16089201	1
Caelo	Metronidazole	16089201	2
Caelo	Metronidazole	16089202	6
Caelo	Metronidazole	16089209	4
Caelo	Metronidazole	16089212	10
Phönix	Metronidazole	16089212	1
AHD 03.02.17	Metronidazole	16089212	1
Caelo	Metronidazole	16089213	7
Caelo	Metronidazole	16089215	8
hochhaus-Apotheke	Metronidazole	16089215	1
Caelo	Metronidazole	16089216	2
Caelo	Metronidazole	16089217	2
Caelo	Metronidazole	16089218	6
Caelo	Metronidazole	16089219	5
Caelo	Metronidazole	16089220	4
Caelo	Metronidazole	16089221	2
Caelo	Metronidazole	16089222	1
Caelo	Metronidazole	16089223	3
Apotheke an der Bornhei...	Metronidazole	16089223	1
Ebert-Jacobi	Metronidazole	16089224	1

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Supplier	Substance	Batch	Spectra
Caelo	Metronidazole	16089225	1
Caelo	Metronidazole	16089224	1
Caelo	Metronidazole	16089228	2
Fagron	Metronidazole	16089235	1
Euro/Sanacorp	Metronidazole	1609028	1
Euro OTC	Metronidazole	1609028-01	11
Caelo	Metronidazole	160902801	1
EURO / Sanacorp	Metronidazole	160902801	1
Farchemia S. r. l.	Metronidazole	1609028-01	1
Caelo	Metronidazole	1609028-01	3
Euro OTC	Metronidazole	1609028-02	3
Farchemia/Phönix	Metronidazole	1609028-02	1
Euro OTC	Metronidazole	1612013-01	2
Caelo	Metronidazole	161201301	1
Fagron	Metronidazole	1619b04326155	1
Fagron	Metronidazole	16I19-B04	4
Fagron	Metronidazole	16I19-B04-326150	1
Fagron	Metronidazole	16I19-B04-326151	2
Fagron	Metronidazole	16I19-B04-326155	3
Fagron	Metronidazole	16I19-B04-329159	1
Fagron	Metronidazole	16J19-B04-326151	1
Fagron	Metronidazole	16I19-B04-329165	1
Frago/Noweda	Metronidazole	16I19-B04-329163	1
Fagron	Metronidazole	17/19-304-329168	1
Euro OTC	Metronidazole	1701039	1
Euro OTC	Metronidazole	1701039-01	7
EuRho	Metronidazole	1701039-01	1
Caelo	Metronidazole	17058001	1
Sanacorp	Metronidazole	17058002	1
Caelo	Metronidazole	17058002	2
Phönix	Metronidazole	17058003	1
Caelo	Metronidazole	17058004	1
Caelo	Metronidazole	17058005	1
Caelo	Metronidazole	17058010	1
Phönix	Metronidazole	17058016	1
Caelo	Metronidazole	17058016	1
Caelo	Metronidazole	17058017	1
Caelo	Metronidazole	17058019	2
Fagron	Metronidazole	172939-B01-295547	1
Fagron	Metronidazole	19119-B04-326154	1
Caelo	Metronidazole	18071401	1
Euro OTC	Metronidazole	20120974	1
Fagron	Metronidazole	20130906F	4
Fagron	Metronidazole	20140131F	3
Caelo	Metronidazole	23011504	1
Fagron	Metronidazole	20140131f	1
Caelo	Metronidazole	27092014A	1
Fagron	Metronidazole	3095007	1
Sanacorp	Metronidazole	39/AKD18	1
Gatt-Koller	Metronidazole	3728/11162017	1
Caelo	Metronidazole	39/AKD4	1
Sanacorp	Metronidazole	39/AKD6	1
Caelo	Metronidazole	39/AKD7	1
Caelo	Metronidazole	41/AKD16	1
Fagron	Metronidazole	606/10072017	1
Gatt-Koller	Metronidazole	606293914	1
Caelo	Metronidazole		1
Sanacorp	Metronidazole		2
ACM	Metronidazole		1
Caelo	Metronidazole	P145/14	1

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Supplier	Substance	Batch	Spectra
Caelo	Metronidazole	1210411	1
Caelo	Metronidazole	102311870	1
Euro OTC	Metronidazole	1220150132	1
Caelo	Metronidazole	2071304	1
Caelo	Metronidazole	607211870	1
Caelo	Metronidazole	614U1870	1
Caelo	Metronidazole	8012014B	1
Fagron	Metronidazole	8I10-N19	1
Fagron	Metronidazole	9041303	1
Caelo	Metronidazole	9175609	1
Caelo	Metronidazole	10368311	1
Euro OTC	Metronidazole	1003028-02	1
Caelo	Metronidazole	10112907	1
Caelo	Metronidazole	10368313	1
Gehe	Metronidazole	10368318	1
Caelo	Metronidazole	10368319	1
Caelo	Metronidazole	10368318	1
Fagron	Metronidazole	10F23-N05	1
Caelo	Metronidazole	10368320	1
Fargon	Metronidazole	1101017-01	1
Euro OTC	Metronidazole	1101017-03	1
Phoenix am 11.06.2012	Metronidazole	1101017-03	2
Euro OTC	Metronidazole	1101017-3	1
Euro OTC	Metronidazole	1109016-01	4
ANZAG am 18.05.2012	Metronidazole	1109016-01	1
Euro OTC	Metronidazole	1109030-01	7
Post-Apotheke	Metronidazole	1109030-01	1
Caelo	Metronidazole	1109030-01	2
Euro OTC	Metronidazole	1109030-02	2
Post-Apotheke	Metronidazole	1109030-02	1
EuRho	Metronidazole	1109030-02	1
EuRho	Metronidazole	110903002	1
Euro OTC	Metronidazole	1109030-03	3
Phönix	Metronidazole	1109030-03	1
Anzag 09.07.2013	Metronidazole	1112028	1
Euro OTC	Metronidazole	1112028-01	6
Euro OTC	Metronidazole	1112028-02	8
Caelo	Metronidazole	1112028-02	2
Gehe	Metronidazole	1112028-02	1
Gehe 08.06.2013	Metronidazole	111202802	1
Anzag 09.07.2013	Metronidazole	1112028-02	1
Fagron	Metronidazole	112356	1
Caelo	Metronidazole	11319806	1
Caelo	Metronidazole	11319807	1
Caelo	Metronidazole	11319809	1
Caelo	Metronidazole	11319816	3
Caelo	Metronidazole	11319812	1
VDL	Metronidazole	11319816	1
Kehr	Metronidazole	11319817	1
Caelo	Metronidazole	11319817	2
Caelo	Metronidazole	11319818	4
Noweda	Metronidazole	11319818	2
Spangropharm	Metronidazole	11319818	1
Caelo	Metronidazole	11319823	6
Caelo	Metronidazole	11319819	1
Caelo	Metronidazole	11319824	3
Noweda	Metronidazole	11319824	1
Caelo	Metronidazole	11319825	6
Kehr	Metronidazole	11319825	1
Anzag	Metronidazole	11373512	1

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Supplier	Substance	Batch	Spectra
Fagron	Metronidazole	11C21-N01	2
Fagron	Metronidazole	11F15-N07	1
Fagron	Metronidazole	11F15-N07	1
Fagron	Metronidazole	11H11-n03	1
Caelo	Metronidazole	11h11-n03	1
Noweda	Metronidazole	11J07-N07	1
Fagron	Metronidazole	11J07-N07	1
Caelo	Metronidazole	1201156	1
Kehr	Metronidazole	1210411	1
Caelo	Metronidazole	12110105	1
Caelo	Metronidazole	12110121	1
Caelo	Metronidazole	12110403	1
Noweda	Metronidazole	12110404	1
Caelo	Metronidazole	12110405	9
Noweda	Metronidazole	12110405	1
Caelo	Metronidazole	121104085	1
Caesar&loretz,Phoenix	Metronidazole	12110410	1
Gehe	Metronidazole	12110410	1
Caelo	Metronidazole	12110411	8
Caelo	Metronidazole	12110410	2
Caelo	Metronidazole	12110412	8
Fargon	Metronidazole	12110412	1
Caelo	Metronidazole	12110413	6
Phönix Gotha	Metronidazole	12110413	1
Caelo	Metronidazole	12110414	3
Noweda	Metronidazole	12110415	1
Caelo	Metronidazole	12110415	4
Gehe	Metronidazole	12110415	1
Alliance Healthcare	Metronidazole	12110415	1
Caelo	Metronidazole	12110421	9
vdl	Metronidazole	12110421	1
Sanacorp	Metronidazole	12110422	1
Caelo	Metronidazole	12110422	19
Gehe	Metronidazole	12110422	1
Caelo	Metronidazole	12110423	2
Caelo	Metronidazole	1211413	1
Caelo	Metronidazole	121145	1
Euro OTC	Metronidazole	1212001-01	11
EuRho	Metronidazole	1212001-02	1
Henry Lamotte	Metronidazole	1212001-02	1
Phönix 08.11.2013	Metronidazole	1212001-02	1
Alliance Health 23.01.2...	Metronidazole	1212001-02	1
Euro OTC	Metronidazole	1212030-01	5
Caelo	Metronidazole	121203001	2
Phönix	Metronidazole	121203001	1
geh 30.08.13	Metronidazole	121203001	1
Phoenix	Metronidazole	121203002	1
Caelo	Metronidazole	12339	1
Caelo	Metronidazole	12339501	7
Noweda	Metronidazole	12339501	1
Caelo	Metronidazole	12339502	25
gehe 11.06.2013	Metronidazole	12339502	1
Alliance	Metronidazole	12339502	1
Caelo	Metronidazole	12339503	6
Caelo	Metronidazole	12339504	11
Caelo	Metronidazole	12339507	9
Caelo	Metronidazole	12339508	5
Phönix, 02.10.13	Metronidazole	12339508	1
Caelo	Metronidazole	12339509	5
Gehe	Metronidazole	12339509	1

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Supplier	Substance	Batch	Spectra
Caelo	Metronidazole	12339510	14
Post-Apotheke	Metronidazole	12339510	1
Caelo	Metronidazole	12339511	15
Phönix/Maros	Metronidazole	12339511	1
Caesar&Loretz GmbH/Anzag	Metronidazole	12339511	1
Caelo	Metronidazole	12339519	13
Sanacorp	Metronidazole	12339519	1
Caelo	Metronidazole	12339520	5
Caesar & Loretz GmbH Hi...	Metronidazole	12339520	1
Caelo	Metronidazole	12359501	1
Caelo	Metronidazole	1239503	1
Caelo	Metronidazole	1239504	1
Fagron	Metronidazole	12D30-N02	1
Fagron	Metronidazole	12D30-N03	4
Fagron	Metronidazole	12F15-N04	9
Euro OTC	Metronidazole	12F15-NO4	1
Noweda	Metronidazole	12G04-N15	1
Fagron	Metronidazole	12g04-n15	1
Sanacorp	Metronidazole	12G04-N15	1
A.H. 19.02.13 ek: 5,86EUR	Metronidazole	12G04-N15	1
Fagron	Metronidazole	12L17N16	1
Fagron	Metronidazole	12L17N11	1
Erika apotheke	Metronidazole	12L17-N11	2
Fagron	Metronidazole	12l17-n11	1
Caelo	Metronidazole	12L17-N11	4
Phönix	Metronidazole	12L17-N11	1
Sanacorp	Metronidazole	12L17-N16	1
Fagron	Metronidazole	12L-N11	1
Euro OTC	Metronidazole	130704201	1
Caelo	Metronidazole	13095001	11
Euro OTC	Metronidazole	1308704201	1
gehe	Metronidazole	13095005	1
Caelo	Metronidazole	13B06-N023	1
Fagron	Metronidazole	13B06-N03	17
Fagron	Metronidazole	13B06N03	1
Euro OTC	Metronidazole	13B06-N03	1
Fargron	Metronidazole	13D08-n22	1
Fargon	Metronidazole	13D08-N22	1
Fagron	Metronidazole	13D08-N22	8
Fagron	Metronidazole	13D08N22	1
Phönix	Metronidazole	13J21-N07	1
Fagron	Metronidazole	140700301	1
Caelo	Metronidazole	14111304	1
Euro OTC	Metronidazole	14120601	1
Caelo	Metronidazole	14B27-B31-291230	1
Fagron	Metronidazole	14C14-B02291238	1
Euro OTC	Metronidazole	150502403	1
Caelo	Metronidazole	15121202	1
Phönix	Metronidazole	15253002	1
Caelo	Metronidazole	201007126	1
Caelo	Metronidazole	18051201	1
Euro OTC	Metronidazole	20111025	1
Fagron	Metronidazole	20121121	3
Caelo	Metronidazole	2013U-01870	2
Caelo	Metronidazole	20140612-12	1
Caelo	Metronidazole	28061204	1
Caelo	Metronidazole	2813E1870	1
Caelo	Metronidazole	30131-01870	1
Fagron	Metronidazole	3212E01870	1
Caelo	Metronidazole	3112M-01870	1

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Supplier	Substance	Batch	Spectra
Phoenix	Metronidazole		1
Caelo	Metronidazole	39/AKD16	1
Caelo	Metronidazole	3947/V04/16	1
Sanacorp	Metronidazole	39AKD15	1
Henry Lamotte	Metronidazole	5448100	1
Euro OTC	Metronidazole	700837	1
Fagron	Metronidazole	Ch12L17-N11	1
Caelo	Metronidazole	MTZ/2050401	1
Euro OTC	Metronidazole	F120017	1
Fagron	Metronidazole	PM41	1
Caelo	Metronidazole	10368310	1
Euro OTC	Metronidazole	110903002	1
Caelo	Metronidazole	1112028-01	1
Caelo	Metronidazole	11319810	2
Caelo	Metronidazole	12339527	1
Fagron	Metronidazole	12a2o-n18	1
Fagron	Metronidazole	12d30-n03	1

- 75 591 spectra from 463 *Apo-Ident* customers from a total of 25 154 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Metronidazole* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Metronidazole* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	240	0	72 193
Type B	0	450	0	161 623
Type C	0	1464	104	75 591

The substance/substance group *Metronidazole* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.5000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 98.6667 %)
Type C	100.0000 % (> 99.8849 %)	93.3673 % (> 93.1760 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

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Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20857	22472	14.36	65.28
21212	22472	4.27	67.07
21213	22472	5.24	67.61
21356	21881	11.04	66.49
21881	21881	0.00	68.11
22472	22472	0.00	66.87

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Miconazole nitrate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20210-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Miconazole nitrate; Miconazoli nitras; Miconazolum nitricum

Special notes

When selecting the *Miconazole nitrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Miconazole nitrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Miconazole nitrate	13D22-N14	20817	85	20130529
Caelo	Miconazole nitrate	13185601	20875	40	20130704
Caelo	Miconazole nitrate	13352802	21350	39	1412250
Euro OTC	Miconazole nitrate	1307025-02	21649	40	20130806
Euro OTC	Miconazole nitrate	1509014	21900	40	20150930*
Caelo	Miconazole nitrate	161447	22630	40	20160617*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 284 spectra of 6 reference samples from the substance/substance group *Miconazole nitrate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 6 different batches.

- 72 149 spectra from a total of 1576 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 778 spectra from 20 reference samples of the substance/substance group *Miconazole nitrate*.

- These include spectra of independent samples from 8 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Miconazole nitrate	10122908	20210	40
Fagron	Miconazole nitrate	13D22-N14	20817†	5
Caelo	Miconazole nitrate	13185601	20905	80
Caelo	Miconazole nitrate	13352802	21351	40
Euro OTC	Miconazole nitrate	1307025-02	21649†	20
Euro OTC	Miconazole nitrate	1509014	21900†	20
Euro OTC	Miconazole nitrate	1604004	22522	40
Euro OTC	Miconazole nitrate	1607004	22671	40
Euro OTC	Miconazole nitrate	1611024	22920	40
Euro OTC	Miconazole nitrate	1705039	23429	40
Caelo	Miconazole nitrate	172175	23662	40
Euro OTC	Miconazole nitrate	1710020	23775	40

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*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Miconazole nitrate	1803028	24071	40
Caelo	Miconazole nitrate	13185601	20875SI	60
Euro OTC	Miconazole nitrate	1307025-02	21649SI	37
Euro OTC	Miconazole nitrate	1509014	21900SI	53
Euro OTC	Miconazole nitrate	1604004	22522SI	36
Caelo	Miconazole nitrate	161447	22630SI	40
Euro OTC	Miconazole nitrate	1607004	22671SI	30
Euro OTC	Miconazole nitrate	1611024	22920SI	37

- 161 295 spectra from a total of 3485 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 874 spectra from 220 *Apo-Ident* customers from 220 batches from the substance/substance group *Miconazole nitrate*.

- These include spectra of independent samples from 211 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Miconazole nitrate	12374307	18
Euro OTC	Miconazole nitrate	1504003-01	2
Caelo	Miconazole nitrate	15137902	14
Caelo	Miconazole nitrate	15137903	13
Fagron	Miconazole nitrate	15137905	1
Caelo	Miconazole nitrate	15137913	3
Fagron	Miconazole nitrate	15a13-b07-308432	1
Fagron	Miconazole nitrate	15i08-b07-312317	1
Caelo	Miconazole nitrate	16144704	4
Fagron	Miconazole nitrate	15i08-b07-315481	1
Caelo	Miconazole nitrate	16144711	3
Anzag	Miconazole nitrate	12243801	1
Caelo	Miconazole nitrate	12243803	11
Anzag	Miconazole nitrate	12H10-N02	1
Fagron	Miconazole nitrate	12K02-N06	7
Fagron	Miconazole nitrate	12h10-n02	1
Fagron	Miconazole nitrate	13H28-N06	19
Gehe	Miconazole nitrate	14149301	1
Caelo	Miconazole nitrate	1122014A	1
Caelo	Miconazole nitrate	10/AKD11	1
Caelo	Miconazole nitrate	11104109	2
Caelo	Miconazole nitrate	12374308	7
Fagron	Miconazole nitrate	13061501	1

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[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Supplier	Substance	Batch	Spectra
Euro OTC	Miconazole nitrate	1307025-02	2
Caelo	Miconazole nitrate	13185609	8
Großhandel	Miconazole nitrate	13185610	2
Caelo	Miconazole nitrate	13185610	9
Phoenix	Miconazole nitrate	13185611	1
Caelo	Miconazole nitrate	13185612	7
Caelo	Miconazole nitrate	13352801	20
Caelo	Miconazole nitrate	13342801	1
Caelo	Miconazole nitrate		3
Herbasinica	Miconazole nitrate	13352801	1
Gehe am 29.04.2014	Miconazole nitrate	13352802	4
Caelo	Miconazole nitrate	13352802	17
Caesar&Loretz GmbH/Anzag	Miconazole nitrate	13352802	1
Caelo	Miconazole nitrate	13352805	1
Caelo	Miconazole nitrate	13352806	12
Bombastus	Miconazole nitrate	13352806	1
Caelo	Miconazole nitrate	13352811	5
Gehe	Miconazole nitrate	13352811	1
Fagron	Miconazole nitrate	13A14-B09-287486	5
Fagron	Miconazole nitrate	13A14-B09-287487	3
Fagron	Miconazole nitrate	13A14-B09-287488	2
Euro OTC	Miconazole nitrate	140902301	1
Fagron	Miconazole nitrate	14051403	1
Euro OTC	Miconazole nitrate	1409023-01	1
Euro OTC	Miconazole nitrate	140902302	1
Euro OTC	Miconazole nitrate	1409023-02	3
Caelo	Miconazole nitrate	14149301	14
Phoenix 21.10.14	Miconazole nitrate	14149301	1
Caesar & Loretz GmbH Hi...	Miconazole nitrate	14149301	1
Caelo	Miconazole nitrate	14149302	16
Caelo	Miconazole nitrate	14149303	7
Caelo	Miconazole nitrate	14149305	1
Gehe 6.03.15	Miconazole nitrate	14149308	2
Caelo	Miconazole nitrate	14149308	9
Caelo	Miconazole nitrate	14149309	6
Caelo	Miconazole nitrate	14149310	8
Noweda	Miconazole nitrate	14149310	1
Caesar&Loretz GmbH /Anzag	Miconazole nitrate	14149310	1
GEHE 13.05	Miconazole nitrate	14149311	1
Caelo	Miconazole nitrate	14149311	13
Noweda	Miconazole nitrate	14149311	1
Fagron	Miconazole nitrate	14149313	1
EuroPTC/Phönix	Miconazole nitrate	14149316	1
Caelo	Miconazole nitrate	14149317	5
Caelo	Miconazole nitrate	14149318	22
Caelo	Miconazole nitrate	1419301	1
Caelo	Miconazole nitrate	1419310	1
Fagron	Miconazole nitrate	14B18-B02-291249	1
Fagron	Miconazole nitrate	14B18-B02	6
Fagron	Miconazole nitrate	14B18B02	1
Fagron	Miconazole nitrate	14B18-B02-291232	4
Caelo	Miconazole nitrate	14B18-B02-291233	1
Fagron	Miconazole nitrate	14B18-B02-291233	3
Fagron	Miconazole nitrate	14B18-B02-291247	1
Fagron	Miconazole nitrate	14B18-B02-291248	6
Fagron	Miconazole nitrate	14B18B02291233	1
Fagron	Miconazole nitrate	14D255-B06-294959	1
Fagron	Miconazole nitrate	14D25-B06	4
Fagron	Miconazole nitrate	14D25-B06-294958	13
Fagron	Miconazole nitrate	14D25B06294958	1

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Supplier	Substance	Batch	Spectra
Fagron	Miconazole nitrate	14D25-B06-294959	8
Caelo	Miconazole nitrate	14D25-B06-294959	1
Fagron	Miconazole nitrate	14d25-b06-294960	1
Fagron	Miconazole nitrate	14D25-B06-294960	3
Caelo	Miconazole nitrate	14D25-B06-294960	3
Fagron	Miconazole nitrate	14D25-B06-299790	3
Fagron	Miconazole nitrate	14d25-b06-299790	1
Fagron	Miconazole nitrate	14H06-B01-299799	7
Fagron	Miconazole nitrate	14H06-B01-299798	1
Caelo	Miconazole nitrate	14H06-B01-299799	1
Fagron	Miconazole nitrate	14H06-B01-299813	4
Caelo	Miconazole nitrate	15/05-B07-312317	1
Fagron	Miconazole nitrate	15/08-B07-312317	1
Fagron	Miconazole nitrate	15/08-B07-315481	2
Fagron	Miconazole nitrate	15/08-B07-316911	1
Caelo	Miconazole nitrate	15/08-B07-315481	1
Fagron	Miconazole nitrate		2
Fagron	Miconazole nitrate	15/08-B07-318485	1
Fagron	Miconazole nitrate	15/08-B07-318686	1
EuRho	Miconazole nitrate	1504003-01	1
Euro OTC	Miconazole nitrate	1504903-01	1
Fagron	Miconazole nitrate	1508-B07-318686	1
Euro OTC	Miconazole nitrate	1509014-01	6
Fagron	Miconazole nitrate	15108-B07-318485	1
Anzag	Miconazole nitrate	15137902	1
Noweda	Miconazole nitrate	15137903	1
Caelo	Miconazole nitrate	15137904	1
Caelo	Miconazole nitrate	15137905	7
Caelo	Miconazole nitrate	15137906	1
Caelo	Miconazole nitrate	15137907	5
phönix	Miconazole nitrate	15137907	1
Caelo	Miconazole nitrate	15137908	5
Caelo	Miconazole nitrate	15137909	2
Caelo	Miconazole nitrate	15137910	4
Caesar & Loretz/AHC	Miconazole nitrate	15137910	1
Caelo	Miconazole nitrate	15137911	1
Caelo	Miconazole nitrate	15137915	3
Caelo	Miconazole nitrate	15137914	1
Phoenix	Miconazole nitrate	15137915	1
E+J, 27.09.2016	Miconazole nitrate	15137915	1
Fagron	Miconazole nitrate	15A13-807	1
Caelo	Miconazole nitrate	15A13-B07	1
Fagron	Miconazole nitrate	15A13-B07	6
Fagron	Miconazole nitrate	15A13-B07-306791	4
Fagron	Miconazole nitrate	15A13-B07-306565	1
Fagron	Miconazole nitrate	15A13-B07-307140	9
Caelo	Miconazole nitrate	15A13-B07-307140	1
Anzag	Miconazole nitrate	15A13-B07-308432	1
Caelo	Miconazole nitrate	15A13-B07-308432	1
Fagron	Miconazole nitrate	15A13-B07-308432	3
Phoenix	Miconazole nitrate	15E04-B03-327367	1
Fagron	Miconazole nitrate	15I08-B07	4
Fagron	Miconazole nitrate	15I08-B07-3121321	1
Caelo	Miconazole nitrate	15I08-B07-312317	4
Fagron	Miconazole nitrate	15I08-B07-312317	2
Fagron	Miconazole nitrate	15I08-B07-312321	8
Fagron	Miconazole nitrate	15I08-B07-31485	1
Fagron	Miconazole nitrate	15I08-B07-315481	3
Caelo	Miconazole nitrate	15I08-B07-315481	1
Fagron	Miconazole nitrate	15I08-B07-315492	2

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Supplier	Substance	Batch	Spectra
Fagron	Miconazole nitrate	15I08-B07-318485	2
Fagron	Miconazole nitrate	15I08-B07-318686	1
Bombastus	Miconazole nitrate	15I08-B07-318686	1
Bombastus	Miconazole nitrate	15I08-B07-318687	1
Fagron	Miconazole nitrate	15I08-B07-312321	1
Caelo	Miconazole nitrate	15I08-B07-314838	1
Euro OTC	Miconazole nitrate	15I08-B07-318485	1
Fagron	Miconazole nitrate	15I08-B07-315492	1
Ichthyol/Phoenix	Miconazole nitrate	16/098/M	1
Caelo	Miconazole nitrate	15I08-B07-318686	1
Euro OTC	Miconazole nitrate	1604004-01	3
Euro OTC	Miconazole nitrate	1611024-02	1
Euro	Miconazole nitrate	1611024-01	1
Caelo	Miconazole nitrate	161144715	1
Caelo	Miconazole nitrate	16144701	13
phönix	Miconazole nitrate	16144701	2
Euro OTC	Miconazole nitrate	16144701	1
Caelo	Miconazole nitrate	16144702	13
Caesar & Loretz GmbH	Miconazole nitrate	16144702	1
Gehe	Miconazole nitrate	16144702	1
Caelo	Miconazole nitrate	16144703	6
Caelo	Miconazole nitrate	16144710	8
Caelo	Miconazole nitrate	16144716	6
phönix	Miconazole nitrate	16144716	1
Caelo	Miconazole nitrate	16144717	6
Caesar & Loretz GmbH	Miconazole nitrate	16144717	1
Caelo	Miconazole nitrate	16144718	1
Caelo	Miconazole nitrate	16144720	1
Caesar&Loretz GmbH	Miconazole nitrate	16144721	1
Caelo	Miconazole nitrate	16144721	2
Caelo	Miconazole nitrate	16144725	1
Caelo	Miconazole nitrate	16144726	1
Fagron	Miconazole nitrate	16E04-B03	1
Caelo	Miconazole nitrate	16E04-B03-321367	1
Fagron	Miconazole nitrate	16E04-B03-321367	3
Caelo	Miconazole nitrate	16e04-b03-321367	1
Fagron	Miconazole nitrate	16E04-B03-322	1
Fagron	Miconazole nitrate	16E04-B03-322124	6
Caelo	Miconazole nitrate	16E04-B03-322124	3
Euro OTC	Miconazole nitrate	16E04-B03-322124	1
Phönix	Miconazole nitrate	16E04-B03-322124	1
Fagron	Miconazole nitrate	16E04-B03-322131	1
Phönix	Miconazole nitrate	16E04-B03-322131	1
Fagron	Miconazole nitrate	16E04-B03-322132	3
Gehe/Ichthyol	Miconazole nitrate	16E04-B03-322132	1
Fagron	Miconazole nitrate	16E04-B03-325448	1
Fagron	Miconazole nitrate	16E04-B03-327362	2
Gehe	Miconazole nitrate	16E04-B03-327362	1
Fagron	Miconazole nitrate	16E04-B03-330082	3
Euro OTC	Miconazole nitrate	1705039-01	2
Phönix	Miconazole nitrate	17217502	1
Caelo	Miconazole nitrate	17217502	1
Fagron	Miconazole nitrate	17C01-B02-334877	1
Fagron	Miconazole nitrate	17C01-B02-334882	1
Fagron	Miconazole nitrate	19051402	1
Fagron	Miconazole nitrate	2900/03/16	1
Fagron	Miconazole nitrate	2900/04/14	3
Caelo	Miconazole nitrate	2900/10/14	1
Caelo	Miconazole nitrate	2900/11/15	3
Fagron	Miconazole nitrate	2900/15/13	2

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Supplier	Substance	Batch	Spectra
Fagron	Miconazole nitrate	2900/16/14	2
Fagron	Miconazole nitrate	29000414	1
Caelo	Miconazole nitrate	29001614	1
Alliance H.	Miconazole nitrate	5137910	1
Caelo	Miconazole nitrate	8/AKD4	1
Sanacorp	Miconazole nitrate		1
Caelo	Miconazole nitrate	4061304	1
Fagron	Miconazole nitrate	4111301	1
Caelo	Miconazole nitrate	9177904	1
Caelo	Miconazole nitrate	11104103	2
Caelo	Miconazole nitrate	1/AD1	1
Caelo	Miconazole nitrate	11104108	2
Caelo	Miconazole nitrate	11104113	3
Caelo	Miconazole nitrate	11104114	1
Gehe	Miconazole nitrate	11104114	1
Caelo	Miconazole nitrate	11324901	2
Caelo	Miconazole nitrate	11243803	1
Herbasinica	Miconazole nitrate	11324901	1
Caelo	Miconazole nitrate	11324902	1
sanacorp	Miconazole nitrate	11324902	1
Caesar & Loretz GmbH, 4...	Miconazole nitrate	11324904	1
Caelo	Miconazole nitrate	11324905	5
Phoenix, 13.08.2012	Miconazole nitrate	11324905	1
Caelo	Miconazole nitrate	11324909	2
Anzag, 24.10.2012	Miconazole nitrate	11324913	1
Caelo	Miconazole nitrate	11324912	2
Caelo	Miconazole nitrate	11324913	1
Fagron	Miconazole nitrate	12/21-M03	1
Caelo	Miconazole nitrate	12243801	3
Sanacorp	Miconazole nitrate	12243801	1
Caelo	Miconazole nitrate	12243802	4
Anzag	Miconazole nitrate	12243802	1
Großhandel	Miconazole nitrate	12243803	1
Sanacorp	Miconazole nitrate	12243803	2
Kehr	Miconazole nitrate	12243805	1
Caelo	Miconazole nitrate	12243805	6
Caesar und Loretz	Miconazole nitrate	12243805	1
Großhandel	Miconazole nitrate	12243806	1
Caelo	Miconazole nitrate	12243806	1
Caesar&Loretz GmbH D-4...	Miconazole nitrate	12243808	1
Caelo	Miconazole nitrate	12243808	8
Fagron	Miconazole nitrate	12243808	2
Caesar&loretz,Phoenix	Miconazole nitrate	12374301	1
Caelo	Miconazole nitrate	12374301	4
Alliance Healthcare	Miconazole nitrate	12374307	1
Großhandel	Miconazole nitrate	12374308	1
Noweda	Miconazole nitrate	12A16-N02	5
Fagron	Miconazole nitrate	12A16-N02	3
Bionorica /Phönix	Miconazole nitrate	12C13B03-279593	1
Fagron	Miconazole nitrate	12H10-N02	6
Klenk	Miconazole nitrate	12h10-n02	1
Noweda	Miconazole nitrate	12K02-N06	3
Caelo	Miconazole nitrate	12k02n06	1
Euro OTC	Miconazole nitrate	1307025-01	2
Fagron	Miconazole nitrate	13091R	1
Fagron	Miconazole nitrate	1316Q-03451	1
Caelo	Miconazole nitrate	13185601	8
Caelo	Miconazole nitrate	13185602	5
Herstellung	Miconazole nitrate	13185602	1
Caesar & Loretz GmbH, 4...	Miconazole nitrate	13185602	1

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Supplier	Substance	Batch	Spectra
Caelo	Miconazole nitrate	13185603	15
Caesar&Loretz GmbH/Anzag	Miconazole nitrate	13185603	1
Caelo	Miconazole nitrate	13185611	15
20; 04.12.13	Miconazole nitrate	13185611	2
Fagron	Miconazole nitrate	1328-N06	1
Alliance Health 05.02.2...	Miconazole nitrate	13352801	3
Sanacorp	Miconazole nitrate	13352801	1
Phoenix	Miconazole nitrate	13352801	1
Fagron	Miconazole nitrate	13A14-B09	2
Fagron	Miconazole nitrate	13A14B09283005	1
Fagron	Miconazole nitrate	13A14-B09-287453	1
Fagron	Miconazole nitrate	13A14B09287487	1
Fagron	Miconazole nitrate	13D22-N14	14
Fagron	Miconazole nitrate	13d22-n14	1
Caelo	Miconazole nitrate	13D22-N14	2
Fagron	Miconazole nitrate	13E13-N04	2
Fagron	Miconazole nitrate	13E13-N08	2
Fagron	Miconazole nitrate	13H28N06	1
Caelo	Miconazole nitrate	13H28-N06	1
Phönix	Miconazole nitrate	13H28-N06	1
Fagron	Miconazole nitrate	13H28-NO6	2
Caelo	Miconazole nitrate	14B18-B02	1
Fagron	Miconazole nitrate	14B18-B02-291250	1
Fagron	Miconazole nitrate	14D25-B06294959	1
Fagron	Miconazole nitrate	15/08-B07-314838	1
Fagron	Miconazole nitrate	17011307	1
Fagron	Miconazole nitrate	15I08-B07-3144838	1
Fagron	Miconazole nitrate	20081201	1
Fagron	Miconazole nitrate	27061202	1
Caelo	Miconazole nitrate	28051306	1
Fagron	Miconazole nitrate	2900/08/12	4
Fagron	Miconazole nitrate	2900/10/14	1
Fagron	Miconazole nitrate	31101306	1
Caelo	Miconazole nitrate	411092-2-P	1
Caelo	Miconazole nitrate	80644099	1
Caelo	Miconazole nitrate	AKD9	1
Caelo	Miconazole nitrate	1307025-02	1
Fagron	Miconazole nitrate	14b18-b02-291247	1
Caelo	Miconazole nitrate	P143/14	1
Fargon	Miconazole nitrate	14D25-B06-294959	1
EUro/AHD	Miconazole nitrate	12243808	1
Anzag	Miconazole nitrate	12374301	3
AHD	Miconazole nitrate	12374307	1

- 76 285 spectra from 463 *Apo-Ident* customers from a total of 25 330 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Miconazole nitrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Miconazole nitrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The

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following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	284	0	72 149
Type B	0	753	25	161 295
Type C	0	866	8	76 285

The substance/substance group *Miconazole nitrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.8873 %)
Type B	100.0000 % (> 99.9928 %)	96.7866 % (> 96.4010 %)
Type C	100.0000 % (> 99.8849 %)	99.0847 % (> 98.7414 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20817	21900	1.03	33.52
20875	22630	5.18	28.74
21350	21350	0.00	28.60
21649	21350	4.96	27.66
21900	21900	0.00	33.09
22630	22630	0.00	31.84

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Minoxidil**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20879-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Minoxidil; Minoxidilum

Special notes

When selecting the *Minoxidil* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Minoxidil*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Minoxidil	13039501	20879	40	20130306
Caelo	Minoxidil	14093701	21359	40	20140428
Euro OTC	Minoxidil	1311038-01	21630	40	AR-15-FG-007848-01
Euro OTC	Minoxidil	1411006-01	21912	40	20141210
Euro OTC	Minoxidil	1509035	21933	40	20151016*
Euro OTC	Minoxidil	1602013	22365	40	20160225*
Euro OTC	Minoxidil	1612011	22982	40	20170130*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 280 spectra of 7 reference samples from the substance/substance group *Minoxidil*. These samples are listed above in the section *calibration samples*. The reference samples originate from 7 different batches.

- 72 153 spectra from a total of 1575 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 539 spectra from 14 reference samples of the substance/substance group *Minoxidil*.

- These include spectra of independent samples from 5 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Minoxidil	14093701	21361	40
Euro OTC	Minoxidil	1311038-01	21630†	19
Euro OTC	Minoxidil	1411006-01	21912†	20
Euro OTC	Minoxidil	1509035	21933†	20
Euro OTC	Minoxidil	1602013	22365†	20
Euro OTC	Minoxidil	1607007	22688	40
Euro OTC	Minoxidil	1705008	23437	40
Caelo	Minoxidil	172278	23816	40
Euro OTC	Minoxidil	1710043	23896	40
Euro OTC	Minoxidil	1803004	24062	40
Euro OTC	Minoxidil	1411006-01	21912SI	60
Euro OTC	Minoxidil	1509035	21933SI	60
Euro OTC	Minoxidil	1602013	22365SI	60
Euro OTC	Minoxidil	1612011	22982SI	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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- 161 534 spectra from a total of 3488 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 964 spectra from 238 *Apo-Ident* customers from 237 batches from the substance/substance group *Minoxidil*.

- These include spectra of independent samples from 221 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Euro OTC	Minoxidil	4/13	2
Bombastus	Minoxidil	4/13	1
icrom spa	Minoxidil	511v	1
Euro OTC	Minoxidil	6/12	2
ICROM	Minoxidil	6/12	1
Fagron	Minoxidil	7/13	2
Audor Pharma	Minoxidil	8/14M	1
Euro OTC	Minoxidil	10/13	1
Fagron	Minoxidil	15/13	1
Euro OTC	Minoxidil	19/16	1
Audor Pharma	Minoxidil	414E-02844	1
Caelo	Minoxidil	5081502	1
Fagron	Minoxidil	612212844	1
Euro OTC	Minoxidil	6614849	1
Euro OTC	Minoxidil	1009042-01	3
EuRho	Minoxidil	1105030-02	1
Fagron	Minoxidil	11021402	1
Fagron	Minoxidil	10J14-N19	1
Euro OTC	Minoxidil	104029-02	1
Euro OTC	Minoxidil	1102010-02	1
EuRho	Minoxidil	1108039-02	2
Euro OTC	Minoxidil	1108039-03	1
Fagron	Minoxidil	111012010	1
Euro OTC	Minoxidil	1112024-01	3
Euro OTC	Minoxidil	1112024-02	7
Caelo	Minoxidil	1112024-01	1
Anzag	Minoxidil	1112024-02	1
Euro OTC	Minoxidil	1112024-03	6
Phönix	Minoxidil	1112024-03	1
Fiebig ek: 36.06EUR 31.0812	Minoxidil	111202403	1
Bombastus	Minoxidil	1112024-03	1
Euro/Gehe	Minoxidil	1112024-03	1
Caelo	Minoxidil	11150207	2
Caelo	Minoxidil	11302003	2
Caelo	Minoxidil	11150209	1

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[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Supplier	Substance	Batch	Spectra
Post-Apotheke	Minoxidil	11302005	2
Caelo	Minoxidil	11302005	1
Phagron/Ph	Minoxidil	11E17-N07	2
Fagron	Minoxidil	11E17-N07	1
Caelo	Minoxidil	11e17-n07	1
Fagron	Minoxidil	11K11-N09	3
Caelo	Minoxidil	12023901	3
Sanacorp	Minoxidil	120056-01	1
Phoenix 21.02.2013	Minoxidil	12023901	1
Caelo	Minoxidil	12023902	2
Caelo	Minoxidil	12023907	6
Caelo	Minoxidil	12023908	2
Euro OTC	Minoxidil	1203035	1
Caelo	Minoxidil	1203035	1
Euro OTC	Minoxidil	1203035-0	1
Euro OTC	Minoxidil	1203035-01	10
Euro OTC	Minoxidil	120303501	2
Icrom Spa	Minoxidil	1203035-01	1
Anzag 14.11.12 ek:40,14	Minoxidil	120303501	1
Anzag 18.10.12 ek:40,14	Minoxidil	1203035-01	1
Caelo	Minoxidil	1203035-01	3
Sanacorp	Minoxidil	1203035-01	1
Euro OTC	Minoxidil	1203035-02	8
Euro OTC	Minoxidil	120303502	1
Phönix	Minoxidil	1203035-02	2
Euro OTC	Minoxidil	1203035-03	14
Caelo	Minoxidil	120303503	1
Fagron	Minoxidil	120303503	1
Euro OTC	Minoxidil	120303503	2
Anzag 07.02.13 ek: 40,14EUR	Minoxidil	120303503	1
Alliance Healthc. 15.05...	Minoxidil	1203035-03	1
Euro OTC	Minoxidil	12100056-01	1
Euro OTC	Minoxidil	12100560	1
Sanacorp	Minoxidil	1210056-01	1
Euro OTC	Minoxidil	1210056-01	17
Alliance Healthcare	Minoxidil	1210056-01	1
Europharm/Sanacorp	Minoxidil	1210056-01	1
Caelo	Minoxidil	1210056-01	2
Euro OTC	Minoxidil	121005601	1
AHD	Minoxidil	1210056-01	1
Caelo	Minoxidil	121005601	1
Euro OTC	Minoxidil	1210056-02	27
Caelo	Minoxidil	1210056-02	3
Alliance Healthcare	Minoxidil	1210056-02	1
Sanacorp	Minoxidil	1210056-02	2
AHC 14.08.13 EK40,14	Minoxidil	1210056-02	1
Caelo	Minoxidil	12273703	2
Caelo	Minoxidil	12273704	5
Caelo	Minoxidil	12273710	1
Gehe 02.07.2013	Minoxidil	123039503	1
Fagron	Minoxidil	12A25-N04	5
Fagron	Minoxidil	12C29-N050087/240	1
Fagron	Minoxidil	12C29-N050145/240	1
Klenk	Minoxidil	12c29-n05	1
Noweda	Minoxidil	12C29-N05	1
Fagron	Minoxidil	12C29-N05	5
Hedinger/Sanacorp	Minoxidil	12C29-N05	1
Fagron	Minoxidil	12H07-N03	22
Fagron	Minoxidil	12H07N03	1
Fagron	Minoxidil	12H07-N030265/432	1

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Supplier	Substance	Batch	Spectra
Fagron	Minoxidil	12H07-NO3	1
Fagron	Minoxidil	12H07-No3	1
Caelo	Minoxidil	13039501	9
Fagron	Minoxidil	12HO7-NO3	1
Caelo	Minoxidil	13/23-N07	1
Caesar & Loretz GmbH	Minoxidil	13039501	1
Caelo	Minoxidil	13039503	3
Alliance Health 04.11.2...	Minoxidil	13039503	1
Euro OTC	Minoxidil	1304029-01	18
euroct/Gehe	Minoxidil	1304029-01	1
Phönix	Minoxidil	1304029-01	1
Euro OTC	Minoxidil	130402901	1
Caelo	Minoxidil	130402901	1
Apotärze	Minoxidil	1304029-02	3
EuRho / Noweda	Minoxidil	1304029-02	1
Euro OTC	Minoxidil	1304029-02	17
Euro OTC	Minoxidil	130402902	1
Caelo	Minoxidil	1304029-02	1
Euro	Minoxidil	1304029-02	1
Caelo	Minoxidil	130402902	1
Sanacorp	Minoxidil	1304029-02	1
Euro OTC	Minoxidil	1304029-C2	1
Euro OTC	Minoxidil	1311038-01	33
Caelo	Minoxidil	1309501	1
PhOENIX 19.03.2012	Minoxidil	1311038-01	2
Euro OTC	Minoxidil	131103801	4
Caelo	Minoxidil	1311038-01	3
AHD	Minoxidil	1311038-01	1
Ichthyol-Gesellschaft	Minoxidil	1311038-01	1
Fagron	Minoxidil	1311038-01	1
Euro OTC	Minoxidil	13110838-01	1
Euro OTC	Minoxidil	131138-01	1
Caelo	Minoxidil	13179501	7
Sanacorp	Minoxidil	13179501	2
Sanacorp	Minoxidil	13179502	2
Caelo	Minoxidil	13179502	8
Caelo	Minoxidil	13179503	7
PhOENIX 19.03.2012	Minoxidil	13179503	2
Caelo	Minoxidil	13179507	2
Caelo	Minoxidil	13179504	2
Caelo	Minoxidil	13373106	2
Fargron	Minoxidil	13E13-N10	2
Fagron	Minoxidil	13E13-N10	17
Anzag	Minoxidil	13E13-N10	1
Doppeleiche Apotheke	Minoxidil	13E13-N10	2
Caelo	Minoxidil	13E13-N10	1
Fagron	Minoxidil	13E13N10	1
Fagron	Minoxidil	13H07-NO3	1
Fagron	Minoxidil	13I23-N07	11
Caelo	Minoxidil	13I23-N07	2
Fagron	Minoxidil	13J23N07	2
Fagron	Minoxidil	13J29-B02	1
Fagron	Minoxidil	13K04-B05-0004	1
Fagron	Minoxidil	13K04-B05-290377	6
Fagron	Minoxidil	13K04-B05-290379	2
sanacorp	Minoxidil	13K04-B05-290379	1
Fagron	Minoxidil	13K04-B05-290380	4
Caelo	Minoxidil	13K04B05290380	1
Fagron	Minoxidil	13123-N07	1
Euro OTC	Minoxidil	14050281	1

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Supplier	Substance	Batch	Spectra
Euro OTC	Minoxidil	140502801	3
Euro OTC	Minoxidil	1405028-01	31
sanacorp	Minoxidil	1405028-01	1
Euro/ Phönix	Minoxidil	1405028-01	1
Gehe	Minoxidil	1405028-01	1
Sanacorp	Minoxidil	1405028-01	1
Caelo	Minoxidil	1405028-01	2
Sanacorp	Minoxidil	140502801	1
Euro OTC	Minoxidil		3
Euro OTC	Minoxidil	1405028-1	1
Euro/Gehe	Minoxidil	140528-01	1
Euro OTC	Minoxidil	140528-01	1
Sanacorp	Minoxidil	14093701	1
Caelo	Minoxidil	14093702	3
Caelo	Minoxidil	14093703	5
Noweda	Minoxidil	14093703	1
Sanacorp	Minoxidil	14093702	1
Caelo	Minoxidil	14093706	3
Caelo	Minoxidil	14093707	1
Euro OTC	Minoxidil	1411006-01	35
Caelo	Minoxidil	1411006-01	2
Alliance health	Minoxidil	1411006-01	3
EuRho/Fiebig	Minoxidil	1411006-01	1
Euro OTC	Minoxidil	141100601	5
Fagron	Minoxidil	1411006-01	1
Euro/Phönix	Minoxidil	1411006-01	1
Sanacorp	Minoxidil	1411006-01	1
Euro OTC	Minoxidil	1411006601	1
Fagron	Minoxidil	1420001962	1
Caelo	Minoxidil	14234502	2
Caelo	Minoxidil	14234505	5
Anzag	Minoxidil	14234505	1
Caelo	Minoxidil	14234509	3
Fagron	Minoxidil	14B04-B07	1
Fagron	Minoxidil	14B04-B07-290883	4
Fagron	Minoxidil	14B04-B07-297364	1
Fagron	Minoxidil	14L03-B02	2
Fagron	Minoxidil	14L03-B02-301429	6
Fagron	Minoxidil	14L03-B02301429	1
Fagron	Minoxidil	14L03-B02-301430	2
Fagron	Minoxidil	14L03-B02-301431	1
Caelo	Minoxidil	14L03-B02-301432	1
Fagron	Minoxidil	14L03-B02301434	1
Fagron	Minoxidil	14L03-B02-301541	1
Fagron	Minoxidil	14L03-Bo2-301430	1
Fagron	Minoxidil	15F02B09	1
Euro OTC	Minoxidil	1504013-01	30
Euro OTC	Minoxidil	150401-01	1
Sanacorp	Minoxidil	1504013-01	1
Caelo	Minoxidil	1504013-01	5
Euro	Minoxidil	1504013-01	2
Euro OTC	Minoxidil	1504013-02	26
anzag	Minoxidil	1504013-02	1
AHD	Minoxidil	1504013-02	1
Noweda/Apomix	Minoxidil	1504013-02	1
Euro OTC	Minoxidil	1504013-2	1
Euro OTC	Minoxidil	1509035-01	28
Caelo	Minoxidil	1509035	1
Caelo	Minoxidil	1509035-01	3
phönix	Minoxidil	1509035-01	1

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Supplier	Substance	Batch	Spectra
Euro/Anzag	Minoxidil	150903501	1
Fagron	Minoxidil	1520000768	3
Caelo	Minoxidil	1520002455	1
Caelo	Minoxidil	15230802	3
Caelo	Minoxidil	15230803	2
Caelo	Minoxidil	15230804	3
Caelo	Minoxidil	15230805	2
Caelo	Minoxidil	15230811	4
Caelo	Minoxidil	15436201	3
Gehe	Minoxidil	15436201	1
Caelo	Minoxidil	15436202	5
Sanacorp	Minoxidil	15436202	1
Caelo	Minoxidil	15436204	1
Caelo	Minoxidil	15436404	2
Gehe	Minoxidil	15436406	1
Caelo	Minoxidil	15436406	2
Caelo	Minoxidil	15436408	1
Fagron	Minoxidil	15E19-06-308183	1
Fagron	Minoxidil	15E19-B06	2
Fagron	Minoxidil	15E19-B06-308179	1
Fagron	Minoxidil	15e19-b06-308180	1
Fagron	Minoxidil	15E19-B06-308181	2
Fagron	Minoxidil	15E19-B06-308180	1
Fagron	Minoxidil	15E-19-B06-308182	1
Fagron	Minoxidil	15E19-B06-308182	1
Caelo	Minoxidil	15E19-B06-308183	1
Fagron	Minoxidil	15E19-B06-308183	2
Caelo	Minoxidil	15E19-B06-309180	1
Fagron	Minoxidil	15E19-B06-308183	1
Fagron	Minoxidil	15H07-B03	2
Fagron	Minoxidil	15F02-B08	1
Fagron	Minoxidil	15K17-B05-318240	1
Fagron	Minoxidil	15H07-B01-314726	1
Fagron	Minoxidil	15K17-B05-318241	1
Fagron	Minoxidil	15K17-B05-320188	1
Fagron	Minoxidil	15K17-B05-318691	1
Caelo	Minoxidil	15K17-B06-321926	1
Fagron	Minoxidil	15K17-B06	1
Fagron	Minoxidil	15K17-B06-321926	2
Fagron	Minoxidil	15K17-B06-324965	1
Fagron	Minoxidil	15K17-B06-325490	1
Caelo	Minoxidil	15k17-b06-324965	1
Caelo	Minoxidil	160013-01	1
Euro OTC	Minoxidil	1602013-01	23
Caelo	Minoxidil	1602013-01	6
phönix	Minoxidil	1602013-01	3
Gehe	Minoxidil	1602013-01	1
Icrom/Gehe	Minoxidil	1602013-01	1
Phoenix	Minoxidil	1602013-02	1
Euro OTC	Minoxidil	1602013-02	6
Caelo	Minoxidil	1602013-02	3
Caelo	Minoxidil	160201302	1
Euro/Noweda	Minoxidil	1602013-02	1
Phönix	Minoxidil	1602013-02	1
Dr.August Wolff	Minoxidil	1602013-02	2
Euro OTC	Minoxidil	1602013-1	1
Euro OTC	Minoxidil	16070007-01	1
Euro OTC	Minoxidil	1607001-01	1
Euro OTC	Minoxidil	1607007	1
Euro OTC	Minoxidil	1607007-01	16

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Supplier	Substance	Batch	Spectra
Caelo	Minoxidil	1607007-01	2
EuRho/Noweda	Minoxidil	1607007-01	1
Euro OTC	Minoxidil	1612011	1
Euro/Phönix	Minoxidil	161201101	2
Euro OTC	Minoxidil	1612011-01	13
Phönix	Minoxidil	1612011-01	1
phönix	Minoxidil	1612011-01	2
Gehe	Minoxidil	1612011-01	1
Sanacorp	Minoxidil	1612011-01	1
Hedinger/Fiebig	Minoxidil	1612011-01	1
Fagron	Minoxidil	16J24-B05-332092	1
Euro OTC	Minoxidil	1705008-01	3
Fagron	Minoxidil	16J24-B04	1
Caelo	Minoxidil	17011602	1
Phönix	Minoxidil	1705008-01	1
EuRho/ Alliance	Minoxidil	1705008-01	1
Euro OTC	Minoxidil	1710043-01	3
Fagron	Minoxidil	17B22-B01	1
Fagron	Minoxidil	17B22-B01-334447	1
Euro OTC	Minoxidil	2002312844	1
Caelo	Minoxidil	20160211-1	1
Caelo	Minoxidil	20151112-5	1
Caelo	Minoxidil	22031402	1
Caelo	Minoxidil	24081300l	1
phönix	Minoxidil		1
Caelo	Minoxidil	240912010	1
Fagron	Minoxidil	26021303	1
Fagron	Minoxidil	26111302	1
Fagron	Minoxidil	27081301	1
Caelo	Minoxidil	2905047-01	1
Euro OTC	Minoxidil	29071402	1
Caelo	Minoxidil	2913A-02844	1
Caelo	Minoxidil	3013M-02844	2
Caelo	Minoxidil	31051305	1
Fagron	Minoxidil	4110I-02844	1
Caelo	Minoxidil	5217M-02844	1
Euro OTC	Minoxidil	700158	1
Audor Pharma	Minoxidil	AP001/11M	1
Audor Pharma	Minoxidil	AP001/16M	5
Gehe	Minoxidil	AP006/13M	1
Audor Pharma	Minoxidil	AP006/13M	2
Audor Pharma	Minoxidil	AP006/17M	1
Audor Pharma	Minoxidil	AP007/15M	3
Audor Pharma	Minoxidil	AP008/14M	7
Audor Pharma	Minoxidil	AP010/12M	6
Audor Pharma	Minoxidil	AP016/15M	6
Audor Pharma	Minoxidil	AP011/16M	1
Audor Pharma	Minoxidil	AP020/11M	5
Audor Pharma	Minoxidil	AP23601ML	1
Audor Pharma	Minoxidil		4
Caelo	Minoxidil	AP011/16M	1
Audor Pharma	Minoxidil	AP012/16M	1
Audor Pharma	Minoxidil	AP-016/15M	1
Audor Pharma	Minoxidil	AP088/14M	1
Caelo	Minoxidil		4
apo-ident	Minoxidil	Euro-OTC	1
Fagron	Minoxidil	Fagron	1
Vdl 14.07.14	Minoxidil	1311038-01	1
Hedinger	Minoxidil	14B04-B07	2
Sanacorp, 81,00EUR, 27.1.17	Minoxidil	1607007-01	1

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Supplier	Substance	Batch	Spectra
apo-ident.	Minoxidil	1607007-07	1
Euro OTC	Minoxidil	1108039-01	1
Noweda	Minoxidil	11150207	1
GEHE	Minoxidil	11302003	1
Caelo	Minoxidil	11K11-n09	1
EUro/AHD	Minoxidil	1203035-03	2
A.H.D	Minoxidil	1210056-01	1
Fagron	Minoxidil	1210056-02	1
Caelo	Minoxidil	12H07-N03	4
Euro OTC	Minoxidil	13001	1
Caelo	Minoxidil	13179501-3467312121	1

- 76 195 spectra from 463 *Apo-Ident* customers from a total of 25 315 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Minoxidil* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Minoxidil* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	254	26	72 153
Type B	0	531	8	161 534
Type C	0	947	17	76 195

The substance/substance group *Minoxidil* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	90.7143 % (> 89.6429 %)
Type B	100.0000 % (> 99.9928 %)	98.5158 % (> 97.9592 %)
Type C	100.0000 % (> 99.8849 %)	98.2365 % (> 97.9253 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested

reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20879	22365	1.72	33.06
21359	21933	4.23	34.56
21630	21630	0.00	33.71
21912	21933	3.39	35.48
21933	21933	0.00	33.96
22365	22365	0.00	31.79
22982	22982	0.00	32.99

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Mometasone furoate, micronized**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20100-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Mometasone furoate, micronized; Mometasoni furoas micronisatum; Mometasonum furanicum micronisatum

Special notes

When selecting the *Mometasone furoate, micronized* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Mometasone furoate, micronized*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Mometasone furoa…	13F17-N01	20850	30	20130620
Euro OTC	Mometasone furoa…	1403015-01	21602	40	20140503
Euro OTC	Mometasone furoa…	1510036	22238	40	20151118*
Caelo	Mometasone furoa…	160286	22433	40	20160316*

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Mometasone furoa…	16A20-B06-319750	22887	40	20160209
Euro OTC	Mometasone furoa…	1610009	23136	40	20170321*
Fagron	Mometasone furoa…	13F17-N01	20850SI	29	20130620
Euro OTC	Mometasone furoa…	1403015-01	21602SI	21	20140503
Euro OTC	Mometasone furoa…	1510036	22238SI	20	20151118*
Fagron	Mometasone furoa…	16A20-B06-319750	22887SI	30	20160209

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 330 spectra of 10 reference samples from the substance/substance group *Mometasone furoate, micronized*. These samples are listed above in the section *calibration samples*. The reference samples originate from 6 different batches.

- 72 103 spectra from a total of 1576 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 477 spectra from 17 reference samples of the substance/substance group *Mometasone furoate, micronized*.

- These include spectra of independent samples from 5 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Mometasone furoate, micronized	09F22-N05	20100	40
Caelo	Mometasone furoate, micronized	13304605	21374	60

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*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Mometasone furoate, micronized	1403015-01	21602†	20
Euro OTC	Mometasone furoate, micronized	1510036	22238†	20
Caelo	Mometasone furoate, micronized	160286	22433†	20
Euro OTC	Mometasone furoate, micronized	1606021	22715	40
Caelo	Mometasone furoate, micronized	163532	23046	40
Euro OTC	Mometasone furoate, micronized	1711027	23878	40
Fagron	Mometasone furoate, micronized	13F17-N01	20850SI†	15
Caelo	Mometasone furoate, micronized	13304605	21374SI	38
Euro OTC	Mometasone furoate, micronized	1403015-01	21602SI†	10
Euro OTC	Mometasone furoate, micronized	1510036	22238SI†	10
Caelo	Mometasone furoate, micronized	160286	22433SI	30
Euro OTC	Mometasone furoate, micronized	1606021	22715SI	33
Caelo	Mometasone furoate, micronized	163532	23046SI	23
Euro OTC	Mometasone furoate, micronized	1610009	23136SI	20
Euro OTC	Mometasone furoate, micronized	1711027	23878SI	18

- 161 596 spectra from a total of 3489 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 592 spectra from 184 *Apo-Ident* customers from 215 batches from the substance/substance group *Mometasone furoate, micronized*.

- These include spectra of independent samples from 212 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Mometasone furoate, micronized	5/0715	1
Caelo	Mometasone furoate, micronized	1/AKD15	1
Sanacorp	Mometasone furoate, micronized	1/AKD4	1
Caelo	Mometasone furoate, micronized	11H10-N01	1
Fagron	Mometasone furoate, micronized	10E31-N26	1
Fagron	Mometasone furoate, micronized	11K28-N09	2
Caelo	Mometasone furoate, micronized	12351202	4
Caelo	Mometasone furoate, micronized	12351205	2
Caelo	Mometasone furoate, micronized	12351208	1
Caelo	Mometasone furoate, micronized	12351215	4
Phönix	Mometasone furoate, micronized	13/23-N02	2
AHD 20.06.14 EK 37,29	Mometasone furoate, micronized	12C07-B05-291268	1
EuRho/Phönix	Mometasone furoate, micronized	1307037-01	2
Caelo	Mometasone furoate, micronized	13304603	1
Caelo	Mometasone furoate, micronized	13304604	2
Caelo	Mometasone furoate, micronized	13304605	5

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†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Supplier	Substance	Batch	Spectra
Caelo	Mometasone furoate, micronized	13304606	2
Caelo	Mometasone furoate, micronized	13304609	2
Caelo	Mometasone furoate, micronized	13304612	1
Fagron	Mometasone furoate, micronized	13D08-N06	18
Fagron	Mometasone furoate, micronized	13Do8-N06	1
Fagron	Mometasone furoate, micronized	13F17-N01	10
Fagron	Mometasone furoate, micronized	13J23-N02	20
Fagron	Mometasone furoate, micronized	13H13-N04	14
GEHE 17.04.2014	Mometasone furoate, micronized	13J23-N02	1
Fagron	Mometasone furoate, micronized	13j23-N02	1
Caelo	Mometasone furoate, micronized	13J23-N02	3
Euro OTC	Mometasone furoate, micronized	1403015-01	1
Phönix Gotha	Mometasone furoate, micronized	1403015-01	1
Euro OTG	Mometasone furoate, micronized	1403015-01	1
Euro OTC	Mometasone furoate, micronized	1408010-01	2
EuRho	Mometasone furoate, micronized	1408010-01	1
Caelo	Mometasone furoate, micronized	14281102	2
Caelo	Mometasone furoate, micronized	14281103	1
Fagron	Mometasone furoate, micronized	14C07-B05	1
Fagron	Mometasone furoate, micronized	14C07-B05-291264	1
Fagron	Mometasone furoate, micronized	14c07-b05-291266	2
Fagron	Mometasone furoate, micronized	14C07-B05-291266	5
Caelo	Mometasone furoate, micronized	14C07-B05-291268	9
Fagron	Mometasone furoate, micronized	14C07-B05-291268	5
Fagron	Mometasone furoate, micronized	14C07B05291268	1
Fagron	Mometasone furoate, micronized	14E20-B04	5
Fagron	Mometasone furoate, micronized	14E20-B04-291265	5
Fagron	Mometasone furoate, micronized	14e20b04291265	1
Fagron	Mometasone furoate, micronized	14e20-b04-291265	1
Phönix	Mometasone furoate, micronized	14E20-B04-291267	1
Sanacorp	Mometasone furoate, micronized	14E20-B04-291267	1
Fagron	Mometasone furoate, micronized	14E20-B04-291267	12
Caelo	Mometasone furoate, micronized	14E20-B04-291267	1
Fagron	Mometasone furoate, micronized	14e20-b04-291267	1
Fagron	Mometasone furoate, micronized	14E20-B04-291269	2
Fagron	Mometasone furoate, micronized	14E20-B04-294645	6
Fagron	Mometasone furoate, micronized	14E20-B04-302374	2
Fagron	Mometasone furoate, micronized	14H06-B07297240	1
Fagron	Mometasone furoate, micronized	14H06-B07-297240	5
Caelo	Mometasone furoate, micronized	14H06-B07298481	1
Cael Sanacorp 05.02.2016	Mometasone furoate, micronized	14H06-B07-298481	1
Fagron	Mometasone furoate, micronized	14H06-B07-298481	2
Fagron	Mometasone furoate, micronized	14H06-B07-298482	7
Fagron	Mometasone furoate, micronized	14H06-B07-302375	1
Fagron	Mometasone furoate, micronized	14H06-B07-302376	3
Fagron	Mometasone furoate, micronized	15/11-B02	4
Fagron	Mometasone furoate, micronized	15/11-B02-31447	1
Fagron	Mometasone furoate, micronized	15/11-B02-314479	5
Fagron	Mometasone furoate, micronized	15/11-B02-315705	2
Fagron	Mometasone furoate, micronized	15/11-B02-316705	1
Euro OTC	Mometasone furoate, micronized	1504012-01	8
Caelo	Mometasone furoate, micronized	15/11-Bo2-314479	1
Euro OTC	Mometasone furoate, micronized	1504012-02	3
Caelo	Mometasone furoate, micronized	1510036-001	1
Euro OTC	Mometasone furoate, micronized	1510036-01	10
Caelo	Mometasone furoate, micronized	1510036-01	1
Caelo	Mometasone furoate, micronized	15110301	3
Caelo	Mometasone furoate, micronized	15110305	3
Sanacorp	Mometasone furoate, micronized	15189801	1
Fagro	Mometasone furoate, micronized	1511B02	1

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Supplier	Substance	Batch	Spectra
Caelo	Mometasone furoate, micronized	15189802	3
Caelo	Mometasone furoate, micronized	15189801	1
Caelo	Mometasone furoate, micronized	15189804	2
Caelo	Mometasone furoate, micronized	15189806	1
Caelo	Mometasone furoate, micronized	15189807	5
Caelo	Mometasone furoate, micronized	15189809	3
Caelo	Mometasone furoate, micronized	15279004	2
Caesar u Loretz	Mometasone furoate, micronized	15279004	2
Caelo	Mometasone furoate, micronized	15b11b03	1
Fagron	Mometasone furoate, micronized	15B11-B03	2
phönix	Mometasone furoate, micronized	15B11-b03	1
Fagron	Mometasone furoate, micronized	15B11-B03-304120	6
Fagron	Mometasone furoate, micronized	15B11-B03-304121	9
Caelo	Mometasone furoate, micronized	15B11-B03-304121	2
Fagron	Mometasone furoate, micronized	15B11B03304121	1
Fagron	Mometasone furoate, micronized	15B11B03304122	2
Fagron	Mometasone furoate, micronized	15B11-B03-304122	4
Fagron	Mometasone furoate, micronized	15B11-B03-304123	12
Caelo	Mometasone furoate, micronized	15B11B03304122	1
Fagron	Mometasone furoate, micronized	15B11-B03-304124	2
Fagron	Mometasone furoate, micronized	15B11-B03-308276	1
Fagron	Mometasone furoate, micronized	15B11-B03-308860	2
Fagron	Mometasone furoate, micronized	15b11-b03-304124	1
Euro OTC	Mometasone furoate, micronized	15B11-B03-308860	1
Fagron	Mometasone furoate, micronized	15B11B03308860	1
Fagron	Mometasone furoate, micronized	15G08-B11	2
Fagron	Mometasone furoate, micronized	15G08-B11-0002	1
Fagron	Mometasone furoate, micronized	15G08-B11-310864	5
Caelo	Mometasone furoate, micronized	15G08-B11-310864	1
Fagron	Mometasone furoate, micronized	15G08-B11-312233	4
Caelo	Mometasone furoate, micronized	15G08-B11-310865	1
Fagron	Mometasone furoate, micronized	15G08-B11-317182	9
Caelo	Mometasone furoate, micronized	15G08-B11-317182	1
Euro OTC	Mometasone furoate, micronized	15G08-B11-317182	1
Fagron	Mometasone furoate, micronized	15G08-B11-322737	3
Phönix	Mometasone furoate, micronized	15G08-B11-322737	1
Fagron	Mometasone furoate, micronized	15G08B11322738	1
Fagron	Mometasone furoate, micronized	15G08-B11-322738	2
Fagron	Mometasone furoate, micronized	15G-B11-310864	1
Fagron	Mometasone furoate, micronized	15I11-B02-314479	4
Fagron	Mometasone furoate, micronized	15J11-B02-315705	1
Caelo	Mometasone furoate, micronized	1602809	1
Fagron	Mometasone furoate, micronized	16/24-B11-332122	1
Caelo	Mometasone furoate, micronized	16028601	2
Caesar&loretz,AHC,08.08...	Mometasone furoate, micronized		1
Caelo	Mometasone furoate, micronized	16028602	6
Caelo	Mometasone furoate, micronized	16028603	1
Caelo	Mometasone furoate, micronized	16028604	1
caesar&Loretz GmbH,Phön...	Mometasone furoate, micronized	16028604	1
Caelo	Mometasone furoate, micronized	16028605	1
Caelo	Mometasone furoate, micronized	16028606	5
Caelo	Mometasone furoate, micronized	16028607	6
Caelo	Mometasone furoate, micronized	16028609	2
Caelo	Mometasone furoate, micronized	16028614	1
Euro OTC	Mometasone furoate, micronized	160602101	1
Euro OTC	Mometasone furoate, micronized	1606021-01	3
Alte Apotheke	Mometasone furoate, micronized	1606021-01	1
Euro OTC	Mometasone furoate, micronized	1610009-01	3
Euro OTC	Mometasone furoate, micronized	161000901	1
Caelo	Mometasone furoate, micronized	16181704	5

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Supplier	Substance	Batch	Spectra
Caelo	Mometasone furoate, micronized	16181708	1
Caelo	Mometasone furoate, micronized	16181710	1
Caelo	Mometasone furoate, micronized	16181715	3
Gehe	Mometasone furoate, micronized	16353201	1
Caelo	Mometasone furoate, micronized	16353205	1
Caelo	Mometasone furoate, micronized	16353206	1
Caelo	Mometasone furoate, micronized	16353208	2
Caelo	Mometasone furoate, micronized	16353209	1
Fagron	Mometasone furoate, micronized	16724-B11-332112	1
Fagron	Mometasone furoate, micronized	16A20-B06	1
Fagron	Mometasone furoate, micronized	16A20-B06-319748	2
Fagron	Mometasone furoate, micronized	16A20-B06-319749	5
Fagron	Mometasone furoate, micronized	16A20-B06319749	1
Caelo	Mometasone furoate, micronized	16A20-B06-319749	1
Fagron	Mometasone furoate, micronized	16A20-B06-322739	4
Caelo	Mometasone furoate, micronized	16C24B03324852	2
Fagron	Mometasone furoate, micronized	16C24-B03	2
Fagron	Mometasone furoate, micronized	16C24B03	1
Fagron	Mometasone furoate, micronized	16C24-B03-327346	4
Fagron	Mometasone furoate, micronized	16C24-B03-324852	1
Phönix	Mometasone furoate, micronized	16c24-b03-327346	1
Fagron	Mometasone furoate, micronized	16C24-B03-327372	3
Fagron	Mometasone furoate, micronized	16C24-b03-327372	1
Fagron	Mometasone furoate, micronized	16C24-B03-328272	1
Fagron	Mometasone furoate, micronized	16J24-B11-329817	3
Fagron	Mometasone furoate, micronized	16j24-b11-329817	1
Caelo	Mometasone furoate, micronized	16J24-B11-332112	1
Fagron	Mometasone furoate, micronized	16J24-B11-330978	2
Fagron	Mometasone furoate, micronized	16J24-B11-334371	1
Fagron	Mometasone furoate, micronized	1716I-07010	1
Caelo	Mometasone furoate, micronized	2/AKD2	1
Fagron	Mometasone furoate, micronized	1814E3640	1
Fagron	Mometasone furoate, micronized	2114M3640	1
Fagron	Mometasone furoate, micronized	2215I-07030	1
Caelo	Mometasone furoate, micronized	200315A	1
Caelo	Mometasone furoate, micronized	3/AKD11	1
Fagron	Mometasone furoate, micronized	3313A-07030	1
Euro OTC	Mometasone furoate, micronized	5991	1
Audor Pharma	Mometasone furoate, micronized	APMOM010/0116M	2
Fagron	Mometasone furoate, micronized	MOM008/0915	1
Fagron	Mometasone furoate, micronized	MOM010/0116	2
Caelo	Mometasone furoate, micronized	NO1352M	1
Fagron	Mometasone furoate, micronized	NS1513M	1
Fagron	Mometasone furoate, micronized	NT1568M	4
Synthexim/Phoenix	Mometasone furoate, micronized	NT1568M	1
Caelo	Mometasone furoate, micronized	NU0698M	1
Fagron	Mometasone furoate, micronized	NU0698M	1
Fagron	Mometasone furoate, micronized	NU2504M	2
Caelo	Mometasone furoate, micronized	NV1000M	1
Fagron	Mometasone furoate, micronized	10G27-N05	1
Fagron	Mometasone furoate, micronized	11F08-N03	2
Fagron	Mometasone furoate, micronized	11H10-N01	3
Euro OTC	Mometasone furoate, micronized	11H10-N04	2
v.d.l	Mometasone furoate, micronized	11h10-n04	1
Caesar & Loretz GmbH, 4...	Mometasone furoate, micronized	11H10-N04	1
Phönix, 14.10.2013	Mometasone furoate, micronized	12351207	1
Caesar & Loretz GmbH, 4...	Mometasone furoate, micronized	12B22-N01	1
Fagron	Mometasone furoate, micronized	10C29-N10	1
Caelo	Mometasone furoate, micronized	12035607	2
Caelo	Mometasone furoate, micronized	12339604	1

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Supplier	Substance	Batch	Spectra
Caelo	Mometasone furoate, micronized	12351203	1
Caelo	Mometasone furoate, micronized	1235210	1
Fagron	Mometasone furoate, micronized	13/23-N02	1
Euro OTC	Mometasone furoate, micronized	1307037-01	1
Fagron	Mometasone furoate, micronized	13D08N06	1
Phönix	Mometasone furoate, micronized	13D08-N06	1
FARGON	Mometasone furoate, micronized	13d08-n06	1
Fagron	Mometasone furoate, micronized	13f17-n01	1
Fagron	Mometasone furoate, micronized	13F27-N02	8
Fagron	Mometasone furoate, micronized	13F27-NO2	1
Caelo	Mometasone furoate, micronized	13H13N04	1
Fagron	Mometasone furoate, micronized	13j23n02	1
Alliance Health 27.01.2...	Mometasone furoate, micronized	13J23-N02	1
Caelo	Mometasone furoate, micronized	14281101	2
Phoenix	Mometasone furoate, micronized	14C07-B05-291268	1
Caelo	Mometasone furoate, micronized	18102013B	1
Caelo	Mometasone furoate, micronized	240913a	1
Caelo	Mometasone furoate, micronized		2
Fagron	Mometasone furoate, micronized	10805-N12	1
Fagron	Mometasone furoate, micronized	11C02-N03	4
Fagron	Mometasone furoate, micronized	11h10-n04	1
Kehr	Mometasone furoate, micronized	12/29-N03	1
Fagron	Mometasone furoate, micronized	12/29-No3	1
Caelo	Mometasone furoate, micronized	12035601	2
Euro OTC	Mometasone furoate, micronized	1203024-02	1
Caelo	Mometasone furoate, micronized	12035608	3
Caesar & Loretz GmbH	Mometasone furoate, micronized	12035601	1
Caeo	Mometasone furoate, micronized	12351201	1
Caelo	Mometasone furoate, micronized	12351207	1
Caelo	Mometasone furoate, micronized	12351210	1
Fagron	Mometasone furoate, micronized	12B22-N01	4
Fagron	Mometasone furoate, micronized	12B22-N04	1
Fagron	Mometasone furoate, micronized	12e02-n11	1
Fagron	Mometasone furoate, micronized	12E02-N11	4
Caelo	Mometasone furoate, micronized	12E02-N11	1
Fagron	Mometasone furoate, micronized	12H09-N02	11
Anzag	Mometasone furoate, micronized	12H09-N02	1
Fagron	Mometasone furoate, micronized	12I29-N03	1
Fagron	Mometasone furoate, micronized	12J29-N03	9
Anzag	Mometasone furoate, micronized	12J29N03	1
Caelo	Mometasone furoate, micronized	1304011-01	1
Caelo	Mometasone furoate, micronized	13D08-N06	1
Anzag	Mometasone furoate, micronized	13D08-N06	1
Gehe	Mometasone furoate, micronized	13D08-N06	1
Fagron	Mometasone furoate, micronized	13d08-n06	1
Fagron	Mometasone furoate, micronized	13F17-NO1	1
Caelo	Mometasone furoate, micronized	13F27-N02	2
Fagron	Mometasone furoate, micronized	13F7-N01	1
Caelo	Mometasone furoate, micronized	13H13-N04	1
Fagron	Mometasone furoate, micronized	13H13-NO4	1
Caelo	Mometasone furoate, micronized	14E20-B04	1
Phönix	Mometasone furoate, micronized	15b11-b03-30412	1
Fagron	Mometasone furoate, micronized	NS0420M	2
Caelo	Mometasone furoate, micronized	NT1568M	1
Fagron	Mometasone furoate, micronized	11H10-N04	1
Fargon	Mometasone furoate, micronized	14h06-b07-298481	1
Caeo/Noweda	Mometasone furoate, micronized	15279003	1
Fagron	Mometasone furoate, micronized	15b11-b03-308276	1
Fagron	Mometasone furoate, micronized	2714U-07030	1
Herbasinica	Mometasone furoate, micronized	12035602	1

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Supplier	Substance	Batch	Spectra
Caelo	Mometasone furoate, micronized	12035605	1
Fagron	Mometasone furoate, micronized	12J29-N01	1
Holdermann	Mometasone furoate, micronized	13D08-N06	1
Holdermann	Mometasone furoate, micronized	14C07-B05-29126	1
Fagron	Mometasone furoate, micronized	13j23-no2	1
Caelo	Mometasone furoate, micronized	14e20-b04-291267	1
Caelo	Mometasone furoate, micronized	701834-0002	1
Fagron	Mometasone furoate, micronized	11k28-n09	1
Fargon	Mometasone furoate, micronized	13H13-N04	1

- 76 567 spectra from 463 *Apo-Ident* customers from a total of 25 336 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Mometasone furoate, micronized* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Mometasone furoate, micronized* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	330	0	72 103
Type B	0	407	70	161 596
Type C	0	391	201	76 567

The substance/substance group *Mometasone furoate, micronized* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9887 %)	100.0000 % (> 98.1818 %)
Type B	100.0000 % (> 99.9928 %)	85.3249 % (> 84.6960 %)
Type C	100.0000 % (> 99.8849 %)	66.0473 % (> 65.5405 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

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Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20850	22433	4.03	58.85
21602	22433	4.81	63.94
22238	22238	0.00	60.02
22433	22433	0.00	59.77
22887	22433	3.01	58.03
23136	23136	0.00	57.76

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Monostereates**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20691-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Monostereates; Glycerinum monostearinicum 40-55%; Glycerinum monostearinicum 60; Glycerinum monostearinicum emulsificantes; Glycerol monostearate 40-55%; Glycerol monostearate 60; Glycerol monostearate, emulsifying; Glyceroli monostearates 40-55%; Glyceroli monostearates 60; Glyceroli monostearates emulsificantes; Sorbitan stearate; Sorbitani stearas; Sorbitanum monostearinicum

Special notes

When selecting the *Monostereates* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Monostereates*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Glycerol monoste…	12105705	20691	80	20120424
Caelo	Glycerol monoste…	12210401	20751	80	1407214

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Glycerol monoste…	12210401	20783	40	20120726
Caelo	Sorbitan stearate	12274801	20828	40	20120924
Caelo	Glycerol monoste…	12105720	20867	40	20120424
Caelo	Glycerol monoste…	13109304	21093	40	1407633
Caelo	Glycerol monoste…	13232604	21437	40	1504599
Caelo	Glycerol monoste…	14099903	21446	40	AR-15-FG-000732-02
Caelo	Glycerol monoste…	14240607	21576	40	1412120
Caelo	Glycerol monoste…	14240607	21585	40	20140815
Fagron	Sorbitan stearate	14J07-B02-299399	21885	40	AR-16-FG-004368-01
Caelo	Glycerol monoste…	15286302	21982	40	20150911
Caelo	Glycerol monoste…	14308310	21993	40	20150109
Fagron	Glycerol monoste…	15E13-B03-305532	22277	40	20150703
Caelo	Glycerol monoste…	15286302	22320	40	AR-16-FG-009226-01
Caelo	Glycerol monoste…	154450	22464	40	20160225*
Caelo	Glycerol monoste…	161646	22623	40	20160727*
Caelo	Glycerol monoste…	16030301	22667	40	20160204
Caelo	Glycerol monoste…	162338	22743	40	20160822*
Caelo	Sorbitan stearate	162352	22764	40	20160826*
Caelo	Glycerol monoste…	16233804	23188	40	10052
Caelo	Sorbitan stearate	17030805	23706	40	20170210
Caelo	Sorbitan stearate	172564	23831	40	20171027*
Caelo	Glycerol monoste…	180683	24025	40	20180430*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 1040 spectra of 24 reference samples from the substance/substance group *Monostereates*. These samples are listed above in the section *calibration samples*. The reference samples originate from 21 different batches.

- 71 393 spectra from a total of 1561 batches from further 362 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 1201 spectra from 31 reference samples of the substance/substance group *Monostereates*.

- These include spectra of independent samples from 14 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Glycerol monostearate 40-55%	08J14-M04	20039	31
Caelo	Glycerol monostearate 60	10097203	20175	40
Caelo	Glycerol monostearate, emuls...	10080113	20286	30
Caelo	Sorbitan stearate	11145401	20351	40
Caelo	Glycerol monostearate 60	1127201902	20576	40
Caelo	Glycerol monostearate 60	11272902	20608	40
Caelo	Glycerol monostearate, emuls...	11079309	20621	80
Caelo	Glycerol monostearate 60	11272902	20677	80
Fagron	Sorbitan stearate	11I26-N09	20736	40
Fagron	Glycerol monostearate, emuls...	11I15-N09	20746	80
Fagron	Glycerol monostearate, emuls...	12B14-N10	20786	40
Caelo	Glycerol monostearate 60	13232604	21437†	20
Caelo	Glycerol monostearate 40-55%	14099903	21446†	20
Fagron	Glycerol monostearate 40-55%	14C12-B40-292622	21545	60
Caelo	Glycerol monostearate, emuls...	14240607	21576†	20
Caelo	Glycerol monostearate, emuls...	14240607	21585†	20
Fagron	Sorbitan stearate	14J07-B02-299399	21885†	20
Caelo	Glycerol monostearate 60	15286302	21982†	20
Caelo	Glycerol monostearate, emuls...	14308310	21993†	20
Fagron	Glycerol monostearate 40-55%	15E13-B03-305532	22277†	20
Caelo	Glycerol monostearate, emuls...	14308310	22278	60
Caelo	Glycerol monostearate 60	15286302	22320†	20
Caelo	Glycerol monostearate, emuls...	14308310	22341	60
Caelo	Glycerol monostearate 40-55%	154450	22464†	20
Caelo	Glycerol monostearate 60	162338	22646	40
Caelo	Glycerol monostearate 60	162338	22741	40
Caelo	Glycerol monostearate 60	162338	22742	40
Caelo	Glycerol monostearate 60	162338	22744	40
Caelo	Sorbitan stearate	171781	23622	40
Caelo	Glycerol monostearate, emuls...	172585	23822	40
Caelo	Sorbitan stearate	180432	24021	40

- 160 872 spectra from a total of 3476 batches from further 860 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

- 147 spectra from 86 *Apo-Ident* customers from 74 batches from the substance/substance group *Monostereates*.

- These include spectra of independent samples from 64 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Glycerol monostearate 60	13109304	9
Caelo	Glycerol monostearate, emuls...	13109402	1
Caelo	Glycerol monostearate, emuls...	13109405	3
Caelo	Glycerol monostearate, emuls...	13109409	2
Caelo	Glycerol monostearate, emuls...	13109410	1
Caelo	Glycerol monostearate 40-55%	131156602	1
Caelo	Glycerol monostearate 40-55%	13221308	1
Caelo	Glycerol monostearate 60	14012002	4
Caelo	Glycerol monostearate 40-55%	14169701	1
Caelo	Glycerol monostearate 40-55%	14169710	1
Caelo	Glycerol monostearate 40-55%	14169717	2
Caelo	Glycerol monostearate, emuls...	1420607	1
Gehe	Glycerol monostearate, emuls...	14240605	2
Caelo	Glycerol monostearate, emuls...	14240607	1
Caelo	Glycerol monostearate, emuls...	14240611	1
Caelo	Glycerol monostearate, emuls...	14308310	3
Caelo	Glycerol monostearate 60	15009203	6
Fagron	Glycerol monostearate 40-55%	15280903	1
Caelo	Glycerol monostearate 40-55%	15280903	2
Caelo	Glycerol monostearate 40-55%	15445007	1
Caelo	Glycerol monostearate, emuls...	16030301	2
Caelo	Glycerol monostearate, emuls...	16030304	1
Caelo	Glycerol monostearate, emuls...	16164606	1
Noweda	Glycerol monostearate, emuls...	11079301	1
Caelo	Glycerol monostearate, emuls...	11079308	1
Caelo	Glycerol monostearate 40-55%	12105729	1
Caesar/Noweda	Glycerol monostearate 60	13109304	1
Fagron	Glycerol monostearate 40-55%	12K05-N06	2
Caesar u Loretz	Glycerol monostearate 60	13109304	1
Caelo	Glycerol monostearate 40-55%	13156601	3
Spangropharm	Glycerol monostearate 40-55%	80402468	1
Anzag	Glycerol monostearate 60	12180502	1
Caesar/Noweda	Glycerol monostearate 40-55%	13221311	2
Caelo	Glycerol monostearate 60	13232604	1
Audor Pharma	Glycerol monostearate 60	13232604	1
Caesar u Loretz	Glycerol monostearate 60	14012002	1
Fagron	Glycerol monostearate 60	15009203	1
Noweda	Glycerol monostearate 60	15009203	1
Caesar & Loretz/Noweda	Glycerol monostearate 60	15009203	1
Caelo	Glycerol monostearate 60	15286302	2
Fagron	Glycerol monostearate 40-55%	15E13-B03	1
Euro OTC	Glycerol monostearate 60	16233804	1
Fagron	Glycerol monostearate 40-55%	7G19-N09	1
Fagron	Glycerol monostearate 40-55%	12A27-N11	1
Caelo	Glycerol monostearate 60	13018201	3
Caelo	Glycerol monostearate 60	1301821	1
Phonix	Glycerol monostearate 60	13109304	1
Caelo	Glycerol monostearate 40-55%	13221303	2
Fagron	Glycerol monostearate 40-55%	CG10980003	1
Cealo	Sorbitan stearate	13209409	1
Caelo	Sorbitan stearate	13209417	3
Caelo	Sorbitan stearate	13209418	2
Caelo	Sorbitan stearate	13209419	3

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Supplier	Substance	Batch	Spectra
Caelo	Sorbitan stearate	14038504	1
Caelo	Sorbitan stearate	14038510	1
Caelo	Sorbitan stearate	14038511	2
Caelo	Sorbitan stearate	14218803	4
anzag	Sorbitan stearate	14195	1
Caelo	Sorbitan stearate	14218804	1
Caelo	Sorbitan stearate	14218808	3
Ichthyol/Phoenix	Sorbitan stearate	14372803	1
Caelo	Sorbitan stearate	14372803	1
Fagron	Sorbitan stearate	14J07-B02-299399	1
Caelo	Sorbitan stearate	15300302	5
Caelo	Sorbitan stearate	15300308	2
Caelo	Sorbitan stearate	15415202	5
Caelo	Sorbitan stearate	16235207	3
Caelo	Sorbitan stearate	17030805	1
Caelo	Sorbitan stearate	26031507	1
Caelo	Sorbitan stearate	17178102	1
Caelo	Sorbitan stearate	11145411	1
Großhandel	Sorbitan stearate	12274801	1
Caelo	Sorbitan stearate	12274813	2
Fagron	Sorbitan stearate	12E30-N14	1
Caelo	Sorbitan stearate	12h23-n05	1
Caelo	Sorbitan stearate	13209410	1
Phonix	Sorbitan stearate	13209418	1
Caelo	Sorbitan stearate	13B19-N01	1
Fagron	Sorbitan stearate	13B19-N01	2
Gehe 16.04.2013	Sorbitan stearate	13B19-N01	1
Fagron	Sorbitan stearate	13D10N10	1
Fagron	Sorbitan stearate	13D10-N10	1
Fagron	Sorbitan stearate	5052	1
Caelo	Sorbitan stearate	13209409	2
Caelo	Sorbitan stearate	12085011	1
Caelo	Sorbitan stearate	12274801	1
Caelo	Sorbitan stearate	12274807	1
Nachprüfung	Sorbitan stearate		1
Caelo	Glycerol monostearate, emuls…	13109404	1

- 77 012 spectra from 463 *Apo-Ident* customers from a total of 25 475 batches from a further 697 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Monostereates* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Monostereates* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	1040	0	71 393
Type B	0	944	257	160 872
Type C	0	142	5	77 012

The substance/substance group *Monostereates* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9887 %)	100.0000 % (> 99.4231 %)
Type B	100.0000 % (> 99.9928 %)	78.6012 % (> 78.3514 %)
Type C	100.0000 % (> 99.8850 %)	96.5986 % (> 94.5578 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20691	21446	11.47	41.45
20751	20751	0.00	33.88
20783	20751	2.58	33.73
20828	22764	18.11	44.42
20867	21446	17.10	38.78
21093	21093	0.00	25.52
21437	21437	0.00	34.02
21446	21446	0.00	42.58
21576	21576	0.00	29.13
21585	21576	1.62	29.88
21885	21885	0.00	20.22
21982	22320	3.06	25.70
21993	20751	9.86	32.30
22277	21446	19.99	38.92
22320	22320	0.00	26.15
22464	22464	0.00	46.77
22623	22623	0.00	20.72
22667	20751	7.87	31.90
22743	22743	0.00	23.63
22764	22764	0.00	38.10
23188	23188	0.00	27.82
23706	22764	2.31	38.68
23831	23831	0.00	29.12
24025	24025	0.00	13.86

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Mupirocin calcium**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	`20781-2018-07-18`
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Mupirocin calcium; Calcii mupirocini; Mupirocinum calcii

Special notes

When selecting the *Mupirocin calcium* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Mupirocin calcium*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Mupirocin calcium	`12E02-N07`	`20781`	40	`1401556`
Caelo	Mupirocin calcium	`14276602`	`21745`	40	`20141103`
Caelo	Mupirocin calcium	`161184`	`22454`	40	`20160504`*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Mupirocin calcium*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 120 spectra from 4 reference samples of the substance/substance group *Mupirocin calcium*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Mupirocin calcium	14276602	21745†	20
Caelo	Mupirocin calcium	161184	22454†	20
Fagron	Mupirocin calcium	15H13-B01-316111	23213	40
Caelo	Mupirocin calcium	161608	23860	40

- 161 953 spectra from a total of 3495 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 4 spectra from 4 *Apo-Ident* customers from 4 batches from the substance/substance group *Mupirocin calcium*.

- These include spectra of independent samples from 4 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Mupirocin calcium	15H13-B01	1
Fagron	Mupirocin calcium	14B03-B30-299165	1
Caelo	Mupirocin calcium	83200301013	1
Fagron	Mupirocin calcium	14B03-B30-297291	1

- 77 155 spectra from 463 *Apo-Ident* customers from a total of 25 543 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Mupirocin calcium* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Mupirocin calcium* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	82	38	161 953
Type C	0	2	2	77 155

The substance/substance group *Mupirocin calcium* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	68.3333 % (> 65.8333 %)
Type C	100.0000 % (> 99.8853 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20781	20781	0.00	51.79
21745	22454	7.95	52.80
22454	22454	0.00	52.36

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Naloxone hydrochloride dihydrate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20957-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Naloxone hydrochloride dihydrate; Naloxoni hydrochloridum dihydricum

Special notes

When selecting the *Naloxone hydrochloride dihydrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Naloxone hydrochloride dihydrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Naloxone hydroch…	13D22-N07	20957	40	1402059
Fagron	Naloxone hydroch…	13L12-B03	21271	40	20140113
Audor	Naloxone hydroch…	AP13501078IIN	22811	40	20160429
Caelo	Naloxone hydroch…	163577	23039	40	20170306*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 4 reference samples from the substance/substance group *Naloxone hydrochloride dihydrate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 4 different batches.

- 72 273 spectra from a total of 1578 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 120 spectra from 3 reference samples of the substance/substance group *Naloxone hydrochloride dihydrate*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
zu erfassen	Naloxone hydrochloride dihyd…	`zu erfassen`	20155	40
Caelo	Naloxone hydrochloride dihyd…	15322517	22828	40
Caelo	Naloxone hydrochloride dihyd…	170441	23862	40

- 161 953 spectra from a total of 3497 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B*

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 36 spectra from 9 *Apo-Ident* customers from 21 batches from the substance/substance group *Naloxone hydrochloride dihydrate*.

- These include spectra of independent samples from 19 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Naloxone hydrochloride dihyd…	12G19-N02	3
Phönix	Naloxone hydrochloride dihyd…	13L12-B03-289511	1
Fagron	Naloxone hydrochloride dihyd…	13D22-N07	4
Fagron	Naloxone hydrochloride dihyd…	14F20-B02-296077	2
Caelo	Naloxone hydrochloride dihyd…	15322521	1
Fagron	Naloxone hydrochloride dihyd…	15E28-B01-308324	4
Fagron	Naloxone hydrochloride dihyd…	15B06-B02-304421	1
Fagron	Naloxone hydrochloride dihyd…	15H04-B09-314068	1
Fagron	Naloxone hydrochloride dihyd…	15K11-B05	1
Caelo	Naloxone hydrochloride dihyd…	17044101	1
Fagron	Naloxone hydrochloride dihyd…	11/23-N01	1
Audor Pharma	Naloxone hydrochloride dihyd…	AP13501078N	1
Fagron	Naloxone hydrochloride dihyd…	12-00071	2
Fagron	Naloxone hydrochloride dihyd…	12G19-NO2	1
Fagron	Naloxone hydrochloride dihyd…	13H09-N08	1
Fagron	Naloxone hydrochloride dihyd…	14F20-B02	1
Fagron	Naloxone hydrochloride dihyd…	13L12-B03-289511	1
Fagron	Naloxone hydrochloride dihyd…	15B06-B02-304420	1
Fagron	Naloxone hydrochloride dihyd…	14A28-B33-296076	1
Fagron	Naloxone hydrochloride dihyd…	15H04-B09	3
Fagron	Naloxone hydrochloride dihyd…	15K11-B05-319571	1
Fagron	Naloxone hydrochloride dihyd…	13L12-B03	3

- 77 123 spectra from 463 *Apo-Ident* customers from a total of 25 526 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Naloxone hydrochloride dihydrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Naloxone hydrochloride dihydrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	160	0	72 273
Type B	0	80	40	161 953
Type C	0	30	6	77 123

The substance/substance group *Naloxone hydrochloride dihydrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9928 %)	66.6667 % (> 64.1667 %)
Type C	100.0000 % (> 99.8850 %)	83.3333 % (> 75.0000 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20957	20957	0.00	43.38
21271	20957	5.36	41.23
22811	20957	13.46	47.90
23039	23039	0.00	43.79

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Naphazoline hydrochloride**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20899-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Naphazoline hydrochloride; Naphazolini hydrochloridum; Naphazolinum hydrochloricum

Special notes

When selecting the *Naphazoline hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Naphazoline hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Naphazoline hydr…	12375211	20899	40	20130108
Euro OTC	Naphazoline hydr…	1407034-01	21623	40	AR-15-FG-007847-01
Euro OTC	Naphazoline hydr…	1506015	21859	40	20150727*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Naphazoline hydrochloride*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 240 spectra from 6 reference samples of the substance/substance group *Naphazoline hydrochloride*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Naphazoline hydrochloride	12375211	21397	60
Caelo	Naphazoline hydrochloride	12375211	21398	60
Euro OTC	Naphazoline hydrochloride	1407034-01	21623†	20
Euro OTC	Naphazoline hydrochloride	1506015	21859†	20
Euro OTC	Naphazoline hydrochloride	1607041	22753	40
Euro OTC	Naphazoline hydrochloride	1704005	23385	40

- 161 833 spectra from a total of 3494 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 104 spectra from 76 *Apo-Ident* customers from 61 batches from the substance/substance group *Naphazoline hydrochloride*.

- These include spectra of independent samples from 59 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Naphazoline hydrochloride	588710001	2
Euro OTC	Naphazoline hydrochloride	616620001	1
Fagron	Naphazoline hydrochloride	60494000113K27-N04	1
Caelo	Naphazoline hydrochloride	11081107	2
Euro OTC	Naphazoline hydrochloride	1206037-02	4
Caelo	Naphazoline hydrochloride	1216203	1
Caelo	Naphazoline hydrochloride	12375211	1
Fagron	Naphazoline hydrochloride	13/03-B03	1
Fagron	Naphazoline hydrochloride	13/03-B03-295105	1
Fagron	Naphazoline hydrochloride	13/03-B03-305291	1
Fargon	Naphazoline hydrochloride	13/03-B03-295105	1
Fagron	Naphazoline hydrochloride	13/03-B03305291	1
Fagron	Naphazoline hydrochloride	1303-B03	1
Noweda-Fragon	Naphazoline hydrochloride	1303B03305291	1
Euro OTC	Naphazoline hydrochloride	1307020-03	1
Caelo	Naphazoline hydrochloride	13372603	1
Fagron	Naphazoline hydrochloride	13A07-N06	4
Fagron	Naphazoline hydrochloride	13I03-B03	1
Fagron	Naphazoline hydrochloride	13I03-B03-295105	2
Fagron	Naphazoline hydrochloride	13I03-B03-305291	2
Caelo	Naphazoline hydrochloride	13I03-B03-305291	1
Fagron	Naphazoline hydrochloride	13K27-N04	11
Fagron	Naphazoline hydrochloride	13k27-n04	1
Fagron	Naphazoline hydrochloride	13l03-B03-295105	1
Euro OTC	Naphazoline hydrochloride	14070034-01	1
Euro OTC	Naphazoline hydrochloride	1407034-01	1
Euro OTC	Naphazoline hydrochloride	1407034-02	2
Euro OTC	Naphazoline hydrochloride	1506015-01	1
Euro OTC	Naphazoline hydrochloride	1506015-02	3
Euro OTC	Naphazoline hydrochloride	150601502	1
Caelo	Naphazoline hydrochloride	1506015-2	1
Caelo	Naphazoline hydrochloride	15071404	1
Caelo	Naphazoline hydrochloride	15223301	2
Fagron	Naphazoline hydrochloride	15J05-B05	2
Fagron	Naphazoline hydrochloride	15J05-B05-322527	1
Fagron	Naphazoline hydrochloride	15J05-B05-326850	2
Fagron	Naphazoline hydrochloride	15J05-B05-330834	2
Caelo	Naphazoline hydrochloride	16174101	2
Euro OTC	Naphazoline hydrochloride	1607041-01	1
Fagron	Naphazoline hydrochloride	17C02-B05-335313	2
Fagron	Naphazoline hydrochloride	17C02-B05	1
Fagron	Naphazoline hydrochloride	4509E-01885	2
Phönix	Naphazoline hydrochloride	586550002	1

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Supplier	Substance	Batch	Spectra
Caelo	Naphazoline hydrochloride	9285103	3
Caleo /Herba	Naphazoline hydrochloride	9285103	2
Fagron	Naphazoline hydrochloride	11/05-N02	1
Euro OTC	Naphazoline hydrochloride	1103031-02	1
Caelo	Naphazoline hydrochloride	11081112	1
Anzag, 10.10.2012	Naphazoline hydrochloride	11081112	2
Euro OTC	Naphazoline hydrochloride	113031-01	1
Fagron	Naphazoline hydrochloride	11I05-N02	3
Fagron	Naphazoline hydrochloride	11K25-N03	1
Fagron	Naphazoline hydrochloride	11J13-N08	1
Euro OTC	Naphazoline hydrochloride	1206037-01	1
Fagron	Naphazoline hydrochloride	12K29-N01o256/310	1
Caelo	Naphazoline hydrochloride	12176203	1
Caelo	Naphazoline hydrochloride	1307020-02	1
Fagron	Naphazoline hydrochloride	13C11-N07	4
Fagron	Naphazoline hydrochloride	13C11N07	1
Caelo	Naphazoline hydrochloride	15223303	1
Caelo	Naphazoline hydrochloride	2275310	1
Fagron	Naphazoline hydrochloride	4309I-01885	1
Eurho/Phoenix	Naphazoline hydrochloride	4413I-01885	1
Caelo	Naphazoline hydrochloride	1206037	1
Caelo	Naphazoline hydrochloride	12375203	1

- 77 055 spectra from 463 *Apo-Ident* customers from a total of 25 486 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Naphazoline hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Naphazoline hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	240	0	161 833
Type C	0	100	4	77 055

The substance/substance group *Naphazoline hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 97.5000 %)
Type C	100.0000 % (> 99.8850 %)	96.1538 % (> 93.2692 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

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In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20899	21623	8.14	40.42
21623	21623	0.00	38.66
21859	21859	0.00	37.87

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Naphazoline nitrate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20501-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Naphazoline nitrate; Naphazolini nitras; Naphazolinum nitricum

Special notes

When selecting the *Naphazoline nitrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Naphazoline nitrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Naphazoline nitr…	12L10-N03	20846	40	20121217
Fagron	Naphazoline nitr…	12J08-B40-287904	21808	40	20131129
Euro OTC	Naphazoline nitr…	1512033	22302	40	20160126*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Naphazoline nitrate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 159 spectra from 5 reference samples of the substance/substance group *Naphazoline nitrate*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Naphazoline nitrate	11K21-N24	20501	39
Fagron	Naphazoline nitrate	12J08-B40-287904	21808†	20
Euro OTC	Naphazoline nitrate	1512033	22302†	20
Fagron	Naphazoline nitrate	16A14-B03-327343	23164	40
Euro OTC	Naphazoline nitrate	1512033-01	23275	40

- 161 914 spectra from a total of 3494 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B*

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 11 spectra from 11 *Apo-Ident* customers from 10 batches from the substance/substance group *Naphazoline nitrate*.

- These include spectra of independent samples from 10 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Naphazoline nitrate	11I05-N03	1
Fagron	Naphazoline nitrate	12/21-N05	1
Fagron	Naphazoline nitrate	12I21-N05	1
Fagron	Naphazoline nitrate	12J08-B40	1
Fagron	Naphazoline nitrate	12J08-B40-294166	1
Fagron	Naphazoline nitrate	12j08-b40-303401	1
Fagron	Naphazoline nitrate	16A14-B03-322534	1
Fagron	Naphazoline nitrate	16A14-B03-327343	1
Fagron	Naphazoline nitrate	21021304	1
Fagron	Naphazoline nitrate	12J08B40-294166	1
Audor Pharma	Naphazoline nitrate	12I21-N05	1

- 77 148 spectra from 463 *Apo-Ident* customers from a total of 25 537 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Naphazoline nitrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Naphazoline nitrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	159	0	161 914
Type C	0	10	1	77 148

The substance/substance group *Naphazoline nitrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 96.2264 %)
Type C	100.0000 % (> 99.8851 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20846	22302	5.55	52.17
21808	22302	3.13	50.18
22302	22302	0.00	44.84

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Naproxen**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	22316-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Naproxen; Naproxenum

Special notes

When selecting the *Naproxen* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Naproxen*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Naproxen	15F18-B03-309492	22316	30	AR-16-FG-008486-02
Fagron	Naproxen	15F18-B03-315691	22327	30	20150703
Fagron	Naproxen	16B04-B09-326261	23105	40	20160229

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 100 spectra of 3 reference samples from the substance/substance group *Naproxen*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 333 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 94 spectra from 4 reference samples of the substance/substance group *Naproxen*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Naproxen	15F18-B03-309492	22316†	15
Fagron	Naproxen	15F18-B03-315691	22327†	15
Fagron	Naproxen	17C10-B03-336472	23763	40
Fagron	Naproxen	16B04-B09-321569	not required	24

- 161 979 spectra from a total of 3495 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 0 spectra from 0 *Apo-Ident* customers from 0 batches from the substance/substance group *Naproxen*.

- These include spectra of independent samples from 0 batches, of which no spectra have been used for the generation of the database.

- 77 159 spectra from 463 *Apo-Ident* customers from a total of 25 547 batches from a further 701 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Naproxen* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Naproxen* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	100	0	72 333
Type B	0	94	0	161 979
Type C	0	0	0	77 159

The substance/substance group *Naproxen* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 94.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 93.6170 %)
Type C	100.0000 % (> 99.8849 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
22316	22316	0.00	47.17
22327	22316	0.73	46.81
23105	22316	4.63	44.56

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Neomycin sulfate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20544-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Neomycin sulfate; Neomycin sulphate; Neomycini sulfas; Neomycinum sulfuricum

Special notes

When selecting the *Neomycin sulfate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Neomycin sulfate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Neomycin sulfate	1303033-03	21771	40	AR-15-FG-016582-01
Caelo	Neomycin sulfate	13062923	21814	40	AR-15-FG-016581-01
Fagron	Neomycin sulfate	14C27-B05-302516	21894	40	1604527
Fagron	Neomycin sulfate	14C27-B05-302517	21961	40	20140418
Caelo	Neomycin sulfate	13062923	22276	30	20130315
Euro OTC	Neomycin sulfate	1601046	22381	30	20160212*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 220 spectra of 6 reference samples from the substance/substance group *Neomycin sulfate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 5 different batches.

- 72 213 spectra from a total of 1577 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 475 spectra from 14 reference samples of the substance/substance group *Neomycin sulfate*.

- These include spectra of independent samples from 5 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Neomycin sulfate	11C13-N04	20544	40
Euro OTC	Neomycin sulfate	1102043-02	20758	40
Euro OTC	Neomycin sulfate	1303033-03	21771†	20
Caelo	Neomycin sulfate	13062923	21814†	20
Fagron	Neomycin sulfate	14C27-B05-302516	21894†	20
Fagron	Neomycin sulfate	14C27-B05-302517	21961†	20
Caelo	Neomycin sulfate	13062923	22276†	15
Euro OTC	Neomycin sulfate	1601046	22381†	15
Caelo	Neomycin sulfate	15237602	22389	40
Caelo	Neomycin sulfate	161650	23856	40
Euro OTC	Neomycin sulfate	1802005	23952	40
Fagron	Neomycin sulfate	14C27-B05-302516	21894SI	60
Fagron	Neomycin sulfate	14C27-B05-302517	21961SI	60
Caelo	Neomycin sulfate	13062923	22276SI	45

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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- 161 598 spectra from a total of 3489 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 312 spectra from 155 *Apo-Ident* customers from 95 batches from the substance/substance group *Neomycin sulfate*.

- These include spectra of independent samples from 91 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Euro OTC	Neomycin sulfate	1102043-02	12
VDL Nachliefer; 2.7.15;...	Neomycin sulfate	1303033-03	2
Caelo	Neomycin sulfate	13062923	4
Euro/phönix	Neomycin sulfate	1502004-01	1
Euro OTC	Neomycin sulfate	1502004-01	15
Bombastus	Neomycin sulfate	1601046-01	2
Fagron	Neomycin sulfate	1502004-01	2
Caelo	Neomycin sulfate	9105308	1
Caelo	Neomycin sulfate	10157505	7
Caelo	Neomycin sulfate	9051402	1
Noweda	Neomycin sulfate	1102043-02	1
Caelo	Neomycin sulfate	12276410	2
Fagron	Neomycin sulfate	12H23-N04	5
Euro OTC	Neomycin sulfate	130033-03	1
Euro OTC	Neomycin sulfate	1303001-03	1
Euro OTC	Neomycin sulfate	1303033-01	13
Phönix	Neomycin sulfate	1303033-02	1
Euro OTC	Neomycin sulfate	1303033-02	12
Pfizer USA / Phönix	Neomycin sulfate	1303033-02	1
Euro OTC	Neomycin sulfate	1303033-03	17
phoenix 13.11.14	Neomycin sulfate	1303033-03	1
Caelo	Neomycin sulfate	1303033-03	1
Gehe	Neomycin sulfate	1303033-03	1
Land/Phönix	Neomycin sulfate	13062905	2
Caelo	Neomycin sulfate	13062905	2
Caelo	Neomycin sulfate	13062908	1
Caelo	Neomycin sulfate	13062915	1
Caelo	Neomycin sulfate	13062922	1
caesar&loretz,AHC,7.3.16	Neomycin sulfate	13062923	1
Fagron	Neomycin sulfate	13D10-N05	9
Caelo	Neomycin sulfate	13D10N05	1
Fagron	Neomycin sulfate	13G09N07	2
Fagron	Neomycin sulfate	13G09-N07	17
	Neomycin sulfate	13G09-N07	2
Fagron	Neomycin sulfate	13K15-B33-288069	3

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†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Supplier	Substance	Batch	Spectra
Fagron	Neomycin sulfate	13K15-b33-288069	1
Fagron	Neomycin sulfate	13K15-B33-288073	3
Fagron	Neomycin sulfate	14A31B02	2
Fagron	Neomycin sulfate	14A31-B02	2
Fagron	Neomycin sulfate	14A31-B02-294696	3
Fagron	Neomycin sulfate	14A31B02294696	1
Caelo	Neomycin sulfate	14A31-B02-294696	1
AHD	Neomycin sulfate	14A31-B02-294698	2
Fagron	Neomycin sulfate	14A31-B02-294697	1
fargron	Neomycin sulfate	14A31-B02-294698	1
Fagron	Neomycin sulfate	14A31-B02-294698	1
Fagron	Neomycin sulfate	14A31-B02-302519	2
Fagron	Neomycin sulfate	14A31-B02-296724	1
Fagron	Neomycin sulfate	14C27-B05	1
Fagron	Neomycin sulfate	14C27-B05-302516	1
Fagron	Neomycin sulfate	14C27-B05-302517	1
Taoasis/Phoenix	Neomycin sulfate	1502004-01	1
HenryLamotte	Neomycin sulfate	1502004-01	3
Euro/Phönix	Neomycin sulfate	1502004-01	1
Caelo	Neomycin sulfate	1502004-01	1
EuRho/Sanacorp	Neomycin sulfate	1502004-01	2
Euro OTC	Neomycin sulfate	1502004-03	6
Euro OTC	Neomycin sulfate	1502004-02	1
Caelo	Neomycin sulfate	15237602	2
Jenne	Neomycin sulfate	15237602	1
Caesar&loretz,AHC,05.09...	Neomycin sulfate	15237602	1
Caelo	Neomycin sulfate	15298902	1
Noweda	Neomycin sulfate	15298902	1
Sanacorp	Neomycin sulfate	15298902	1
Caesar&Loretz/Noweda	Neomycin sulfate	15298904	1
Fagron	Neomycin sulfate	15J09-B04	1
Fragon/Phoenix	Neomycin sulfate	15J09-B04322943	1
Fagron	Neomycin sulfate	15J09-B04-314015	2
Fagron	Neomycin sulfate	15J27-B07	1
Cealo/AHD	Neomycin sulfate	15J09-B04-314017	1
Fagron	Neomycin sulfate	15J09-B04-314017	3
Euro OTC	Neomycin sulfate	16001046-01	1
Fagron	Neomycin sulfate	15J09-B04314015	1
Euro OTC	Neomycin sulfate	1601046-01	9
Euro OTC	Neomycin sulfate	160104601	1
Euro OTC	Neomycin sulfate	1601046-02	2
Euro OTC	Neomycin sulfate	16019046-01	1
Caelo	Neomycin sulfate	16122601	1
Caelo	Neomycin sulfate	16122612	4
Caesar&Loretz GmbH,18.0...	Neomycin sulfate	16122612	1
Caelo	Neomycin sulfate	16122618	1
Caelo	Neomycin sulfate	16165008	1
Caelo	Neomycin sulfate	16165016	1
Fagron	Neomycin sulfate	16A20-B01-327433	1
Fagron	Neomycin sulfate	16A20-B10	1
Fagron	Neomycin sulfate	16A20-B10-327433	2
Fagron	Neomycin sulfate	16B10B50328165	1
Fagron	Neomycin sulfate	17B14-B08	1
siehe WE-Prüfprotokoll	Neomycin sulfate	19/12	1
Gehe	Neomycin sulfate	194A-01926	1
Fagron	Neomycin sulfate	4312I-01926	1
Caelo	Neomycin sulfate	5/AKD36	1
Fagron	Neomycin sulfate	F08469	1
Fagron	Neomycin sulfate	F08469	1
Euro OTC	Neomycin sulfate	G73890	1

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Supplier	Substance	Batch	Spectra
Euro OTC	Neomycin sulfate	L34419	1
Fagron	Neomycin sulfate	M71862	2
Caelo	Neomycin sulfate	N05780	1
Fagron	Neomycin sulfate	M98155	1
Caelo	Neomycin sulfate	563313062905	1
Fagron	Neomycin sulfate	10121-N01	1
Caelo	Neomycin sulfate	9105316	1
Caesar & Loretz GmbH, 4...	Neomycin sulfate	11/19-N14	1
Fagron	Neomycin sulfate	11/19-N14	5
AHD	Neomycin sulfate	11/19-N14	1
Euro OTC	Neomycin sulfate	1102043	2
Euro OTC	Neomycin sulfate	1102043-01	3
Caelo	Neomycin sulfate	1102043-02	1
Gehe	Neomycin sulfate	1102043-02	1
aurica/phoenix	Neomycin sulfate	1102043-02	1
EuRho	Neomycin sulfate	1102043-02	1
Alliance Healthcare	Neomycin sulfate	1102043-03	1
Euro OTC	Neomycin sulfate	1102043-03	4
Anzag 13.06.2013	Neomycin sulfate	1102043-03	1
Caelo	Neomycin sulfate	1102043-03	2
EuRho/Sanacorp	Neomycin sulfate	1102043-03	1
Fagron	Neomycin sulfate	11C21-N10	2
Caelo	Neomycin sulfate	11C21-N10	1
Caelo	Neomycin sulfate	12175401	6
Caesar&loretz,Phoenix	Neomycin sulfate	12C13-N04	1
Caelo	Neomycin sulfate	12276405	3
Phönix Gotha	Neomycin sulfate	12C13-N04	1
Fagron	Neomycin sulfate	12C13-N04	4
Fagron	Neomycin sulfate	12G09-N07	1
Anzag	Neomycin sulfate	12H20-N04	1
Caelo	Neomycin sulfate	12H23-N04	1
Fagron	Neomycin sulfate	12I19-N14	1
Alliance Health 13.01.204	Neomycin sulfate	1303033-01	2
phnoix	Neomycin sulfate	130303301	1
Ashland/Sanacorp	Neomycin sulfate	1303033-02	1
Caelo	Neomycin sulfate	1303033-02	1
	Neomycin sulfate	1303033-03	1
Phönix	Neomycin sulfate	13D10-N05	1
Fagron	Neomycin sulfate	13D10-N05	1
Fagron	Neomycin sulfate	13G09-N06	1
Caelo	Neomycin sulfate	13G09-N07	1
Fagron	Neomycin sulfate	13G09-N070129/340	1
Gehe	Neomycin sulfate	183360-0009	1
Euro OTC	Neomycin sulfate	3950/V09/17	1
Caelo	Neomycin sulfate	24111203	1
Caelo	Neomycin sulfate	5/AKD35	1
VDL;24.6.14; 3,55EUR	Neomycin sulfate	1303033-02	2
Caelo	Neomycin sulfate	12276415	1

- 76 847 spectra from 463 *Apo-Ident* customers from a total of 25 454 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Neomycin sulfate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Neomycin sulfate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	220	0	72 213
Type B	0	415	60	161 598
Type C	0	293	19	76 847

The substance/substance group *Neomycin sulfate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.2727 %)
Type B	100.0000 % (> 99.9928 %)	87.3684 % (> 86.7368 %)
Type C	100.0000 % (> 99.8850 %)	93.9103 % (> 92.9487 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21771	21771	0.00	23.17
21814	21814	0.00	21.14
21894	21894	0.00	35.17
21961	21771	6.25	26.44
22276	21814	4.05	18.53
22381	22381	0.00	33.45

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Neostigmine bromide**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20717-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Neostigmine bromide; Neostigmini bromidum

Special notes

When selecting the *Neostigmine bromide* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Neostigmine bromide*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Neostigmine brom…	10144105	20717	40	20100616
Caelo	Neostigmine brom…	12172304	20990	40	1403163
Caelo	Neostigmine brom…	14256802	21816	40	AR-15-FG-014460-01
Caelo	Neostigmine brom…	15228101	21919	40	20151002
Caelo	Neostigmine brom…	14256802	21816SI	40	AR-15-FG-014460-01
Caelo	Neostigmine brom…	15228101	21919SI	40	20151002

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 240 spectra of 6 reference samples from the substance/substance group *Neostigmine bromide*. These samples are listed above in the section *calibration samples*. The reference samples originate from 4 different batches.

- 72 193 spectra from a total of 1578 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 240 spectra from 8 reference samples of the substance/substance group *Neostigmine bromide*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Neostigmine bromide	14256802	21816†	20
Caelo	Neostigmine bromide	15228101	21919†	20
Caelo	Neostigmine bromide	171319	23369	40
Caelo	Neostigmine bromide	17131901	23373	40
Caelo	Neostigmine bromide	14256802	21816SI†	20
Caelo	Neostigmine bromide	15228101	21919SI†	20
Caelo	Neostigmine bromide	171319	23369SI	40
Caelo	Neostigmine bromide	17131901	23373SI	40

- 161 833 spectra from a total of 3495 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 21 spectra from 6 *Apo-Ident* customers from 11 batches from the substance/substance group *Neostigmine bromide*.

- These include spectra of independent samples from 9 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Neostigmine bromide	13177206	6
Caelo	Neostigmine bromide	13177203	2
Caelo	Neostigmine bromide	131772303A	1
Caelo	Neostigmine bromide	15228103	1
Caelo	Neostigmine bromide	14256802	3
Caelo	Neostigmine bromide	131772303B	1
Caelo	Neostigmine bromide	17131901	1
Caelo	Neostigmine bromide	12172301	1
Gehe	Neostigmine bromide	12172301	1
Caelo	Neostigmine bromide	12172304	1
Caelo	Neostigmine bromide	13177201	1
Gehe	Neostigmine bromide	13177201	1
Gehe	Neostigmine bromide	12172307	1

- 77 138 spectra from 463 *Apo-Ident* customers from a total of 25 536 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Neostigmine bromide* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Neostigmine bromide* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	240	0	72 193
Type B	0	240	0	161 833
Type C	0	21	0	77 138

The substance/substance group *Neostigmine bromide* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.5000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 97.5000 %)
Type C	100.0000 % (> 99.8850 %)	100.0000 % (> 71.4286 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20717	20990	4.44	69.23
20990	20990	0.00	68.58
21816	21816	0.00	66.13
21919	21816	5.79	69.77

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Nicotinamide**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20335-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Nicotinamide; Nicotinamidum; Nicotinoylamidum

Special notes

When selecting the *Nicotinamide* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Nicotinamide*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Nicotinamide	13097506	21364	40	20130416
Euro OTC	Nicotinamide	1310025-01	21643	40	20131121
Euro OTC	Nicotinamide	1511010	22251	40	20151203*
Euro OTC	Nicotinamide	1601045	22374	40	20160210*
Euro OTC	Nicotinamide	1610019	22874	40	20161202*
Caelo	Nicotinamide	163048	23050	40	20161123*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 240 spectra of 6 reference samples from the substance/substance group *Nicotinamide*. These samples are listed above in the section *calibration samples*. The reference samples originate from 6 different batches.

- 72 193 spectra from a total of 1576 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 560 spectra from 15 reference samples of the substance/substance group *Nicotinamide*.

- These include spectra of independent samples from 10 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Nicotinamide	10L21-N09	20335	40
Fagron	Nicotinamide	L11060228	20388	40
Caelo	Nicotinamide	11001803	20399	40
Euro OTC	Nicotinamide	1003025-03	20407	40
Euro OTC	Nicotinamide	1108021-01	20577	40
Caelo	Nicotinamide	11001809	20647	40
Euro OTC	Nicotinamide	1310025-01	21643†	20
Euro OTC	Nicotinamide	1511010	22251†	20
Euro OTC	Nicotinamide	1601045	22374†	20
Caelo	Nicotinamide	161136	22434	60
Caelo	Nicotinamide	161136	22625	40
Caelo	Nicotinamide	163048	23038	40

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*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Nicotinamide	1707001	23555	40
Caelo	Nicotinamide	173419	23785	40
Euro OTC	Nicotinamide	1801039	23957	40

- 161 513 spectra from a total of 3485 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 49 spectra from 27 *Apo-Ident* customers from 27 batches from the substance/substance group *Nicotinamide*.

- These include spectra of independent samples from 25 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Euro OTC	Nicotinamide	11401052	1
Phoenix	Nicotinamide	1211031-02	1
Fagron	Nicotinamide	12J02-B03	1
Caelo	Nicotinamide	13097504	1
Caelo	Nicotinamide	13097506	1
Euro OTC	Nicotinamide	1310025-01	4
Euro OTC	Nicotinamide	131002501	1
Caelo	Nicotinamide	13352002	1
Euro OTC	Nicotinamide	1408019-01	4
Caelo	Nicotinamide	14246806	1
Euro OTC	Nicotinamide	1503024-01	2
Caelo	Nicotinamide	1511010-01	1
Euro OTC	Nicotinamide	1511010-01	4
Euro OTC	Nicotinamide	1601045-01	2
Euro OTC	Nicotinamide	1610019-01	3
Caelo	Nicotinamide	1610019-01	1
Caelo	Nicotinamide	16304803	1
Fagron	Nicotinamide	L14020084	1
Euro OTC	Nicotinamide	1707001-01	1
Fagron	Nicotinamide	10L21-N09	1
DSM Nutritional Prod./ ...	Nicotinamide	1106044-01	1
Euro OTC	Nicotinamide	1108021-01	1
Euro OTC	Nicotinamide	1108021-02	1
Euro OTC	Nicotinamide	1211031-01	2
Euro OTC	Nicotinamide	11208021	1
Noweda	Nicotinamide	12133403	2
Euro OTC	Nicotinamide	1211031-02	1
Caelo	Nicotinamide	12133403	1

continued on the next page

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Nicotinamide	12268302	1
Gatt-Koller	Nicotinamide	221406112411	1
Gatt-Koller	Nicotinamide	4456/10104110	1
Euro OTC	Nicotinamide	1106044-01	2
VDL;16.04.15;5,60EUR	Nicotinamide	1408019-01	1

- 77 110 spectra from 463 *Apo-Ident* customers from a total of 25 520 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Nicotinamide* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Nicotinamide* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	240	0	72 193
Type B	0	560	0	161 513
Type C	0	49	0	77 110

The substance/substance group *Nicotinamide* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.5000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 98.9286 %)
Type C	100.0000 % (> 99.8850 %)	100.0000 % (> 87.7551 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

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Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21364	22251	5.93	78.19
21643	22374	2.16	77.11
22251	22251	0.00	77.30
22374	22374	0.00	77.64
22874	22874	0.00	77.11
23050	23050	0.00	76.82

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Nicotinic acid**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20383-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Nicotinic acid; Acidum nicotinicum

Special notes

When selecting the *Nicotinic acid* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Nicotinic acid*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Nicotinic acid	14E01-B09-293947	21692	40	AR-15-FG-008938-01
Fagron	Nicotinic acid	16H19-B02-330121	23225	40	AR-17-FG-016013-01

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 80 spectra of 2 reference samples from the substance/substance group *Nicotinic acid*. These samples are listed above in the section *calibration samples*. The reference samples originate from 2 different batches.

- 72 353 spectra from a total of 1580 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 100 spectra from 3 reference samples of the substance/substance group *Nicotinic acid*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Nicotinic acid	L10070324	20383	40
Fagron	Nicotinic acid	14E01-B09-293947	21692†	20
Euro OTC	Nicotinic acid	1801021	23954	40

- 161 973 spectra from a total of 3496 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 2 spectra from 1 *Apo-Ident* customers from 2 batches from the substance/substance group *Nicotinic acid*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Nicotinic acid	14E01-B09	1
AppliChem	Nicotinic acid	2Q006387	1

- 77 157 spectra from 463 *Apo-Ident* customers from a total of 25 545 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Nicotinic acid* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Nicotinic acid* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	72 353
Type B	0	100	0	161 973
Type C	0	2	0	77 157

The substance/substance group *Nicotinic acid* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 94.0000 %)
Type C	100.0000 % (> 99.8856 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21692	21692	0.00	88.81
23225	23225	0.00	84.36

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Non-ionic emulsifying alcohol**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20467-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Non-ionic emulsifying alcohol; Alcoholes emulsificantes nonionici

Special notes

When selecting the *Non-ionic emulsifying alcohol* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Non-ionic emulsifying alcohol*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Non-ionic emulsi…	13413001	21069	40	1405257
apomix	Non-ionic emulsi…	NS-8350010216	23274	40	20160718

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 80 spectra of 2 reference samples from the substance/substance group *Non-ionic emulsifying alcohol*. These samples are listed above in the section *calibration samples*. The reference samples originate from 2 different batches.

- 72 353 spectra from a total of 1580 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 210 spectra from 5 reference samples of the substance/substance group *Non-ionic emulsifying alcohol*.

- These include spectra of independent samples from 4 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Bombastus	Non-ionic emulsifying alcohol	00238393	20183	50
Bombastus	Non-ionic emulsifying alcohol	00267575	20467	40
Caelo	Non-ionic emulsifying alcohol	13413001	21524	40
Caelo	Non-ionic emulsifying alcohol	162231	22745	40
Caelo	Non-ionic emulsifying alcohol	171836	23576	40

- 161 863 spectra from a total of 3494 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details

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provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 35 spectra from 14 *Apo-Ident* customers from 14 batches from the substance/substance group *Non-ionic emulsifying alcohol*.

- These include spectra of independent samples from 14 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Non-ionic emulsifying alcohol	14241503	1
Euro OTC	Non-ionic emulsifying alcohol	278281	2
Bombastus	Non-ionic emulsifying alcohol	278281	1
Bombastus	Non-ionic emulsifying alcohol	284009	2
Bombastus	Non-ionic emulsifying alcohol	292319	7
Bombastus	Non-ionic emulsifying alcohol	295568	6
Bombastus	Non-ionic emulsifying alcohol	2995568	1
Bombastus	Non-ionic emulsifying alcohol	306666	3
Bombastus	Non-ionic emulsifying alcohol	267575	3
Caelo	Non-ionic emulsifying alcohol	12254402	1
Caelo	Non-ionic emulsifying alcohol	21091302	1
Bombastus	Non-ionic emulsifying alcohol	255946	1
Bombastus	Non-ionic emulsifying alcohol	3066	1
Bombastus	Non-ionic emulsifying alcohol	274059	1
Bombastus	Non-ionic emulsifying alcohol	304997	4

- 77 124 spectra from 463 *Apo-Ident* customers from a total of 25 534 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Non-ionic emulsifying alcohol* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Non-ionic emulsifying alcohol* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	80	0	72 353
Type B	0	210	0	161 863
Type C	0	33	2	77 124

The substance/substance group *Non-ionic emulsifying alcohol* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 97.1429 %)
Type C	100.0000 % (> 99.8850 %)	94.2857 % (> 85.7143 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21069	21069	0.00	29.16
23274	21069	10.82	33.16

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Norethisterone acetate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20797-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Norethisterone acetate; Norethisteroni acetas; Norethisteronum aceticum

Special notes

When selecting the *Norethisterone acetate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Norethisterone acetate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Norethisterone a…	12L14-N03	20797	40	1401558
Euro OTC	Norethisterone a…	1306033-01	21627	20	1511684
Caelo	Norethisterone a…	15417004	23122	40	1711489

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 100 spectra of 3 reference samples from the substance/substance group *Norethisterone acetate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 333 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 160 spectra from 4 reference samples of the substance/substance group *Norethisterone acetate*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Norethisterone acetate	11C10-N03	20230	40
Euro OTC	Norethisterone acetate	1306033-01	21627†	40
Fagron	Norethisterone acetate	14H29-B03-325225	23171	40
Fagron	Norethisterone acetate	17B21-B01-341608	23918	40

- 161 913 spectra from a total of 3495 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 18 spectra from 11 *Apo-Ident* customers from 13 batches from the substance/substance group *Norethisterone acetate*.

- These include spectra of independent samples from 13 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Bombastus	Norethisterone acetate	13J08-N04	1
Euro OTC	Norethisterone acetate	1306033-02	2
Fagron	Norethisterone acetate	13D19-N06	1
Fagron	Norethisterone acetate	13J08-N04	1
Caelo	Norethisterone acetate	13J08-N04	1
Fagron	Norethisterone acetate	14d08-b01-292736	1
Fagron	Norethisterone acetate	14D08-B01-292738	1
Fagron	Norethisterone acetate	14H29-B03-299313	1
Fagron	Norethisterone acetate	14h29-b03-310697	1
Fagron	Norethisterone acetate	23071509	1
Fagron	Norethisterone acetate	10L22-N01	1
Fagron	Norethisterone acetate	11H22-N03	2
Fagron	Norethisterone acetate	22061206	1
Fagron	Norethisterone acetate	13D19-No6	1
Fagron	Norethisterone acetate	12C06-N10	2

- 77 141 spectra from 463 *Apo-Ident* customers from a total of 25 534 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Norethisterone acetate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Norethisterone acetate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	100	0	72 333
Type B	0	152	8	161 913
Type C	0	18	0	77 141

The substance/substance group *Norethisterone acetate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 94.0000 %)
Type B	100.0000 % (> 99.9928 %)	95.0000 % (> 93.1250 %)
Type C	100.0000 % (> 99.8850 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20797	20797	0.00	15.28
21627	21627	0.00	13.25
23122	23122	0.00	9.92

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Octenidine dihydrochloride**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20759-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Octenidine dihydrochloride; Octenidini dihydrochloridum

Special notes

When selecting the *Octenidine dihydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Octenidine dihydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Octenidine dihyd…	12115202	20759	40	20120511
Caelo	Octenidine dihyd…	13071407	20988	40	1407345
Caelo	Octenidine dihyd…	13166806	21331	40	20130718
Caelo	Octenidine dihyd…	15275502	21888	40	20150910
Caelo	Octenidine dihyd…	15356601	21947	40	1604116

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Octenidine dihyd…	170423	23307	40	20170214*
Caelo	Octenidine dihyd…	163355	23309	40	20170403*
Caelo	Octenidine dihyd…	15356601	21947SI	40	1604116
Caelo	Octenidine dihyd…	170423	23307SI	40	20170214*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 360 spectra of 9 reference samples from the substance/substance group *Octenidine dihydrochloride*. These samples are listed above in the section *calibration samples*. The reference samples originate from 7 different batches.

- 72 073 spectra from a total of 1575 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 300 spectra from 8 reference samples of the substance/substance group *Octenidine dihydrochloride*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Octenidine dihydrochloride	15275502	21888†	20
Caelo	Octenidine dihydrochloride	15356601	21947†	20
Caelo	Octenidine dihydrochloride	160330	22485	60
Caelo	Octenidine dihydrochloride	180174	24023	40

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*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Octenidine dihydrochloride	15275502	21888SI	60
Caelo	Octenidine dihydrochloride	15356601	21947SI†	20
Caelo	Octenidine dihydrochloride	163355	23309SI	40
Caelo	Octenidine dihydrochloride	180174	24023SI	40

- 161 773 spectra from a total of 3494 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 113 spectra from 65 *Apo-Ident* customers from 43 batches from the substance/substance group *Octenidine dihydrochloride*.

- These include spectra of independent samples from 41 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Löwen City-Apotheke Bar…	Octenidine dihydrochloride	2042015	1
Caelo	Octenidine dihydrochloride	816M-03732	1
Caelo	Octenidine dihydrochloride	13166801	1
Caelo	Octenidine dihydrochloride	13166808	2
Caelo	Octenidine dihydrochloride	13166810	1
Apomix/Noweda	Octenidine dihydrochloride	13166813	1
Caelo	Octenidine dihydrochloride	15006202	4
Caelo	Octenidine dihydrochloride	15006203	1
Cealo/Sanacorp	Octenidine dihydrochloride	15006207	1
Caelo	Octenidine dihydrochloride	15006207	4
Caesar & Loretz GmbH	Octenidine dihydrochloride	15006210	1
Caelo	Octenidine dihydrochloride	1515E-03732	1
Caelo	Octenidine dihydrochloride	15275502	4
Caelo	Octenidine dihydrochloride	152755020	1
Caelo	Octenidine dihydrochloride	15275503	2
Caelo	Octenidine dihydrochloride	15275504	1
Caelo	Octenidine dihydrochloride	15356601	5
Caelo	Octenidine dihydrochloride	15356603	2
Caelo	Octenidine dihydrochloride	15356703	8
Fagron	Octenidine dihydrochloride	15356703	1
Caelo	Octenidine dihydrochloride	16032803	4
Euro OTC	Octenidine dihydrochloride	16032803	1
Caelo	Octenidine dihydrochloride	16032901	1
Caelo	Octenidine dihydrochloride	16032902	3
Caelo	Octenidine dihydrochloride	16032903	1
Caelo	Octenidine dihydrochloride	16032909	6
Caelo	Octenidine dihydrochloride	16033002	2

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†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Supplier	Substance	Batch	Spectra
Caelo	Octenidine dihydrochloride	16032910	3
Caelo	Octenidine dihydrochloride	16033001	2
Celo	Octenidine dihydrochloride	16277802	1
Caelo	Octenidine dihydrochloride	16277802	6
Fagron	Octenidine dihydrochloride	16277802	1
Bombastus	Octenidine dihydrochloride	16277803	1
Caelo	Octenidine dihydrochloride	16302910	1
Caelo	Octenidine dihydrochloride	16325304	4
Caelo	Octenidine dihydrochloride	16325305	3
Caelo	Octenidine dihydrochloride	16325406	4
Caelo	Octenidine dihydrochloride	16325408	2
Caelo	Octenidine dihydrochloride	16325410	1
Caelo	Octenidine dihydrochloride	16335504	3
Caesar&Loretz GmbH	Octenidine dihydrochloride	16335504	1
Caelo	Octenidine dihydrochloride	16335509	2
Caelo	Octenidine dihydrochloride	16335510	1
Caesar&Loretz GmbH, 14....	Octenidine dihydrochloride	17042302	1
Caelo	Octenidine dihydrochloride	17042304	5
Caelo	Octenidine dihydrochloride	17042903	7
Caelo	Octenidine dihydrochloride	17042305	1
Caelo	Octenidine dihydrochloride	17218503	1
Caelo	Octenidine dihydrochloride	15356602	1

- 77 046 spectra from 463 *Apo-Ident* customers from a total of 25 505 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Octenidine dihydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Octenidine dihydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	360	0	72 073
Type B	0	300	0	161 773
Type C	0	113	0	77 046

The substance/substance group *Octenidine dihydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9887 %)	100.0000 % (> 98.3333 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 98.0000 %)
Type C	100.0000 % (> 99.8850 %)	100.0000 % (> 94.6903 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

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In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20759	20988	5.11	30.55
20988	20988	0.00	30.41
21331	21947	6.03	32.74
21888	21947	4.11	47.27
21947	21947	0.00	40.77
23307	23307	0.00	31.41
23309	23309	0.00	28.68

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Ofloxacin**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	21047-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Ofloxacin; Ofloxacinum

Special notes

When selecting the *Ofloxacin* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Ofloxacin*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Ofloxacin	13A17-N01	21047	40	1403155
Fagron	Ofloxacin	15H19-B01-312926	21918	40	20151006
Fagron	Ofloxacin	15H19-B01-325226	23090	40	1707611

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Ofloxacin*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 430 spectra from 10 reference samples of the substance/substance group *Ofloxacin*.

- These include spectra of independent samples from 1 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Ofloxacin	13A17-N01	21052	40
Fagron	Ofloxacin	13A17-N01	21811	60
Fagron	Ofloxacin	15H19-B01-312926	21918†	20
Fagron	Ofloxacin	15H19-B01-337265	23753	40
Fagron	Ofloxacin	15H19-B01-337265	23754	40
Fagron	Ofloxacin	13A17-N01	21811SI	60
Fagron	Ofloxacin	15H19-B01-312926	21918SI	60
Fagron	Ofloxacin	15H19-B01-325226	23090SI	30
Fagron	Ofloxacin	15H19-B01-337265	23753SI	40
Fagron	Ofloxacin	15H19-B01-337265	23754SI	40

- 161 643 spectra from a total of 3495 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 4 spectra from 3 *Apo-Ident* customers from 3 batches from the substance/substance group *Ofloxacin*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Ofloxacin	13A17-N01	2
Caelo	Ofloxacin	15H19-B01	1
Fagron	Ofloxacin	15H19-B01-314470	1

- 77 155 spectra from 463 *Apo-Ident* customers from a total of 25 544 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Ofloxacin* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ofloxacin* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	415	15	161 643
Type C	0	4	0	77 155

The substance/substance group *Ofloxacin* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	96.5116 % (> 95.8140 %)
Type C	100.0000 % (> 99.8853 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to

exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21047	21047	0.00	22.45
21918	23090	15.18	32.09
23090	23090	0.00	20.43

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Omeprazole**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	21098-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Omeprazole; Omeprazolum

Special notes

When selecting the *Omeprazole* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Omeprazole*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Inresa	Omeprazole	OPFP14017	21787	40	1507407
Fagron	Omeprazole	15K12-B02-314608	22890	40	20151124
Inresa	Omeprazole	OPFP14017/21072016	23273	40	20150428

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Omeprazole*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 260 spectra from 6 reference samples of the substance/substance group *Omeprazole*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Molekular	Omeprazole	150908	21098	40
Inresa	Omeprazole	OPFP14017	21787†	20
Inresa	Omeprazole	OPFP14017	21796	60
Inresa	Omeprazole	OPFP14017	22284	60
Fagron	Omeprazole	15K12-B02-314608	22740	40
Fagron	Omeprazole	16I20-B03-328940	23272	40

- 161 813 spectra from a total of 3495 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 13 spectra from 10 *Apo-Ident* customers from 7 batches from the substance/substance group *Omeprazole*.

- These include spectra of independent samples from 6 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Omeprazole	15B26-B40-305669	3
Fagron	Omeprazole	15K12-B02	2
Fagron	Omeprazole	15k12-B02	1
Fagron	Omeprazole	15K12-B02-314608	3
Fagron	Omeprazole	15K12-B02-525174	2
Fagron	Omeprazole	16120-B03-328940	1
Fagron	Omeprazole	OPFP16030	1

- 77 146 spectra from 463 *Apo-Ident* customers from a total of 25 540 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Omeprazole* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Omeprazole* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	260	0	161 813
Type C	0	13	0	77 146

The substance/substance group *Omeprazole* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 97.6923 %)
Type C	100.0000 % (> 99.8850 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to

exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21787	21787	0.00	60.49
22890	21787	4.78	62.31
23273	21787	4.13	66.79

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Ornithine aspartate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20842-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Ornithine aspartate; Ornithini aspartas; Ornithinum asparticum

Special notes

When selecting the *Ornithine aspartate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Ornithine aspartate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Ornithine aspart…	L1304034-01	20842	40	1402571
Fagron	Ornithine aspart…	14A20-B07-296093	21694	30	1506279
Euro OTC	Ornithine aspart…	1312030-01	21710	40	1506280
Fagron	Ornithine aspart…	14I24-B04-307758	22600	40	20141110
Euro OTC	Ornithine aspart…	1611018	22924	40	20161213*
Euro OTC	Ornithine aspart…	1611018-01	23198	40	20161213
Fagron	Ornithine aspart…	17I21-B05-342561	23864	40	1804455

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 270 spectra of 7 reference samples from the substance/substance group *Ornithine aspartate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 7 different batches.

- 72 163 spectra from a total of 1575 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 155 spectra from 5 reference samples of the substance/substance group *Ornithine aspartate*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Ornithine aspartate	L1107045-01	20439	40
Fagron	Ornithine aspartate	14A20-B07-296093	21694†	15
Euro OTC	Ornithine aspartate	1312030-01	21710†	20
Fagron	Ornithine aspartate	14I24-B04-307758	22599	40
Euro OTC	Ornithine aspartate	1711015	23899	40

- 161 918 spectra from a total of 3494 batches from further 863 substances. These spectra were

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 4 spectra from 1 *Apo-Ident* customers from 3 batches from the substance/substance group *Ornithine aspartate*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Euro OTC	Ornithine aspartate	1501049-01	1
Euro OTC	Ornithine aspartate	L1304034-01	2
Euro OTC	Ornithine aspartate	L-1304034-01	1

- 77 155 spectra from 463 *Apo-Ident* customers from a total of 25 544 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Ornithine aspartate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ornithine aspartate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	270	0	72 163
Type B	0	115	40	161 918
Type C	0	1	3	77 155

The substance/substance group *Ornithine aspartate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.7778 %)
Type B	100.0000 % (> 99.9928 %)	74.1935 % (> 72.2581 %)
Type C	100.0000 % (> 99.8853 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20842	20842	0.00	64.83
21694	21694	0.00	56.68
21710	21710	0.00	45.93
22600	21710	11.43	47.41
22924	22924	0.00	50.56
23198	21694	8.27	58.58
23864	23864	0.00	43.30

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Ornithine hydrochloride**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20389-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Ornithine hydrochloride; Ornithini hydrochloridum; Ornithinum hydrochloricum

Special notes

When selecting the *Ornithine hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Ornithine hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Ornithine hydroc…	13A03-N05	20967	40	1403094
Euro OTC	Ornithine hydroc…	1307028-01	21622	80	20130813
Euro OTC	Ornithine hydroc…	1605011	22573	40	20160601*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 3 reference samples from the substance/substance group *Ornithine hydrochloride*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 273 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 240 spectra from 6 reference samples of the substance/substance group *Ornithine hydrochloride*.

- These include spectra of independent samples from 5 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Ornithine hydrochloride	L11050156	20389	40
Euro OTC	Ornithine hydrochloride	1307028-01	21622†	40
Euro OTC	Ornithine hydrochloride	1612009	22923	40
Euro OTC	Ornithine hydrochloride	1612009-01	23009	40
Euro OTC	Ornithine hydrochloride	1704006	23159	40
Euro OTC	Ornithine hydrochloride	1803018	24085	40

- 161 833 spectra from a total of 3493 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B*

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 8 spectra from 3 *Apo-Ident* customers from 8 batches from the substance/substance group *Ornithine hydrochloride*.

- These include spectra of independent samples from 7 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Ornithine hydrochloride	13/23-No5	1
unbekannt	Ornithine hydrochloride	15000639	1
Fagron	Ornithine hydrochloride	15A13-B03	1
Fagron	Ornithine hydrochloride	13A03-N05	1
Euro OTC	Ornithine hydrochloride	315E-03475	1
Euro OTC	Ornithine hydrochloride	4712A-03475	1
Euro OTC	Ornithine hydrochloride	516Q-03475	1
Euro OTC	Ornithine hydrochloride	1014I-03475	1

- 77 151 spectra from 463 *Apo-Ident* customers from a total of 25 539 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Ornithine hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ornithine hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	160	0	72 273
Type B	0	240	0	161 833
Type C	0	8	0	77 151

The substance/substance group *Ornithine hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 97.5000 %)
Type C	100.0000 % (> 99.8851 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several

new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20967	20967	0.00	70.49
21622	20967	2.93	71.82
22573	22573	0.00	72.76

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Oxalic acid**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20458-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Oxalic acid; Acidum oxalicum cryst.

Special notes

When selecting the *Oxalic acid* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Oxalic acid*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Oxalic acid	13353901	21042	40	20131029
Caelo	Oxalic acid	12212410	21066	40	1403223
Caelo	Oxalic acid	13353918	21774	40	20131029
Caelo	Oxalic acid	171140	23688	40	20170426*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 4 reference samples from the substance/substance group *Oxalic acid*. These samples are listed above in the section *calibration samples*. The reference samples originate from 4 different batches.

- 72 273 spectra from a total of 1578 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 260 spectra from 6 reference samples of the substance/substance group *Oxalic acid*.

- These include spectra of independent samples from 4 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Oxalic acid	11372701	20458	40
Caelo	Oxalic acid	11098216	20462	40
Caelo	Oxalic acid	13353905	21453	60
Caelo	Oxalic acid	13353918	21774†	20
Caelo	Oxalic acid	160502	22487	60
Caelo	Oxalic acid	171140	23287	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 813 spectra from a total of 3493 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 24 spectra from 20 *Apo-Ident* customers from 22 batches from the substance/substance group *Oxalic acid*.

- These include spectra of independent samples from 21 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Oxalic acid	914E-01039	1
Caelo	Oxalic acid	10383104	1
Noweda	Oxalic acid	12212402	1
Caelo	Oxalic acid	12212406	1
Caelo	Oxalic acid	12212411	1
Caelo	Oxalic acid	12212407	1
Caelo	Oxalic acid	13195408	1
Caelo	Oxalic acid	13195414	1
Caelo	Oxalic acid	13353901	1
Caelo	Oxalic acid	13353905	2
Caelo	Oxalic acid	13353907	2
Caelo	Oxalic acid	13353910	1
Caelo	Oxalic acid	13353915	1
Caesar&Loretz GmbH/ All...	Oxalic acid	13353920	1
Caelo	Oxalic acid	14334703	1
Caelo	Oxalic acid	16297401	1
Caelo	Oxalic acid	17114003	1
Caelo	Oxalic acid	4812U-01039	1
sanacorp	Oxalic acid	11098213	1
Caelo	Oxalic acid	12147010	1
Nachprüfung	Oxalic acid		1
Caelo	Oxalic acid	13195413	1

- 77 135 spectra from 463 *Apo-Ident* customers from a total of 25 526 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Oxalic acid* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Oxalic acid* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	153	7	72 273
Type B	0	160	100	161 813
Type C	0	17	7	77 135

The substance/substance group *Oxalic acid* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	95.6250 % (> 93.7500 %)
Type B	100.0000 % (> 99.9928 %)	61.5385 % (> 60.3846 %)
Type C	100.0000 % (> 99.8850 %)	70.8333 % (> 58.3333 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21042	21066	4.25	75.39
21066	21066	0.00	83.65
21774	21066	3.00	78.84
23688	23688	0.00	83.80

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Oxybuprocaine hydrochloride**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20958-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Oxybuprocaine hydrochloride; Oxybuprocaini hydrochloridum; Oxybuprocainum hydrochloricum

Special notes

When selecting the *Oxybuprocaine hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Oxybuprocaine hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Oxybuprocaine hy…	13D16-N12	20958	40	1402060
Fagron	Oxybuprocaine hy…	13J24-B07-295015	21799	40	AR-15-FG-014812-02
Fagron	Oxybuprocaine hy…	15A26-B07-306787	21922	40	20150203
Fagron	Oxybuprocaine hy…	17G21-B03-338576	23745	40	20170823

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 4 reference samples from the substance/substance group *Oxybuprocaine hydrochloride*. These samples are listed above in the section *calibration samples*. The reference samples originate from 4 different batches.

- 72 273 spectra from a total of 1578 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 320 spectra from 8 reference samples of the substance/substance group *Oxybuprocaine hydrochloride*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
zu erfassen	Oxybuprocaine hydrochloride	`zu erfassen`	20159	40
Fagron	Oxybuprocaine hydrochloride	`13J24-B07-295015`	21799†	20
Fagron	Oxybuprocaine hydrochloride	`15A26-B07-306787`	21922†	20
Fagron	Oxybuprocaine hydrochloride	`16L05-B06-334330`	23719	40
Fagron	Oxybuprocaine hydrochloride	`16L05-B06-334330`	23720	40
Fagron	Oxybuprocaine hydrochloride	`16L05-B06-334330`	23752	40
Fagron	Oxybuprocaine hydrochloride	`13J24-B07-295015`	21799SI	60
Fagron	Oxybuprocaine hydrochloride	`15A26-B07-306787`	21922SI	60

- 161 753 spectra from a total of 3496 batches from further 863 substances. These spectra were

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 15 spectra from 8 *Apo-Ident* customers from 10 batches from the substance/substance group *Oxybuprocaine hydrochloride*.

- These include spectra of independent samples from 10 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Oxybuprocaine hydrochloride	13H13-N050001/18	1
Fagron	Oxybuprocaine hydrochloride	13C01-N01	4
Fagron	Oxybuprocaine hydrochloride	13J24B07295015	1
Caelo	Oxybuprocaine hydrochloride	14G21B02300384	1
Fagron	Oxybuprocaine hydrochloride	15A26-B07	1
Fagron	Oxybuprocaine hydrochloride	12L19N01	1
Fagron	Oxybuprocaine hydrochloride	13h13-n05	2
Klenk	Oxybuprocaine hydrochloride	3613M-07321	1
Fagron	Oxybuprocaine hydrochloride	3613N-07321	1
Fagron	Oxybuprocaine hydrochloride	4612M-03639	2

- 77 144 spectra from 463 *Apo-Ident* customers from a total of 25 537 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Oxybuprocaine hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Oxybuprocaine hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	72 273
Type B	0	290	30	161 753
Type C	0	13	2	77 144

The substance/substance group *Oxybuprocaine hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9928 %)	90.6250 % (> 89.6875 %)
Type C	100.0000 % (> 99.8850 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20958	20958	0.00	40.90
21799	21799	0.00	43.51
21922	20958	9.11	39.88
23745	20958	10.64	42.15

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Oxybutynin hydrochloride**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20565-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Oxybutynin hydrochloride; Oxybutynini hydrochloridum; Oxybutyninum hydrochloricum

Special notes

When selecting the *Oxybutynin hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Oxybutynin hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Oxybutynin hydro…	13H26-B03-290572	21543	40	AR-15-FG-002173-01
Fagron	Oxybutynin hydro…	14A29-B09-293841	21704	30	20140227
Fagron	Oxybutynin hydro…	14I16-B03-312059	22732	40	20141007

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 110 spectra of 3 reference samples from the substance/substance group *Oxybutynin hydrochloride*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 323 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 195 spectra from 5 reference samples of the substance/substance group *Oxybutynin hydrochloride*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Oxybutynin hydrochloride	12D24-N07	20565	80
Fagron	Oxybutynin hydrochloride	13H26-B03-290572	21543†	20
Fagron	Oxybutynin hydrochloride	14A29-B09-293841	21704†	15
Fagron	Oxybutynin hydrochloride	16A18-B02-321181	23268	40
Fagron	Oxybutynin hydrochloride	18A12-B03-344347	23995	40

- 161 878 spectra from a total of 3494 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 24 spectra from 9 *Apo-Ident* customers from 14 batches from the substance/substance group *Oxybutynin hydrochloride*.

- These include spectra of independent samples from 14 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Oxybutynin hydrochloride	127979	1
Caelo	Oxybutynin hydrochloride	129099	1
Fagron	Oxybutynin hydrochloride	13H26-B03	1
Fagron	Oxybutynin hydrochloride	14/16-B03-300207	2
Fagron	Oxybutynin hydrochloride	14A29-B09-307322	1
Fagron	Oxybutynin hydrochloride	14a29-b09-307322	2
Caelo	Oxybutynin hydrochloride	14A29-B09-307322	4
Fagron	Oxybutynin hydrochloride	14I16-B03-300207	1
Fagron	Oxybutynin hydrochloride	15F05-B03-315221	2
Fagron	Oxybutynin hydrochloride	15F05-b03-315220	1
Fagron	Oxybutynin hydrochloride	16A18-B02	1
Fagron	Oxybutynin hydrochloride	16A18-B02-322538	3
Fagron	Oxybutynin hydrochloride	16I23-B03-328916	2
Fagron	Oxybutynin hydrochloride	16l23-b03-328916	1
Fagron	Oxybutynin hydrochloride	13H26-B03-287325	1

- 77 135 spectra from 463 *Apo-Ident* customers from a total of 25 533 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Oxybutynin hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Oxybutynin hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	110	0	72 323
Type B	0	195	0	161 878
Type C	0	19	5	77 135

The substance/substance group *Oxybutynin hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 94.5455 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 96.9231 %)
Type C	100.0000 % (> 99.8850 %)	79.1667 % (> 66.6667 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21543	21543	0.00	34.20
21704	21543	3.34	34.12
22732	21543	2.68	35.26

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Oxytetracycline hydrochloride**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20090-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Oxytetracycline hydrochloride; Oxytetracyclini hydrochloridum; Oxytetracyclinum hydrochloricum

Special notes

When selecting the *Oxytetracycline hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Oxytetracycline hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Oxytetracycline …	12130001	20847	40	20120530
Fagron	Oxytetracycline …	13D08-N11	20848	60	20110131
Caelo	Oxytetracycline …	12328103	21039	40	20121214
Euro OTC	Oxytetracycline …	1306022-02	21600	40	1507542
Euro OTC	Oxytetracycline …	1506037	21836	40	20150721*

continued on the next page

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Oxytetracycline ...	15D29-B99-309066	21915	40	20150522
Euro OTC	Oxytetracycline ...	1506037	21999	40	20150721*
Caelo	Oxytetracycline ...	16077002	22503	40	AR-16-FG-011460-01
Euro OTC	Oxytetracycline ...	1602025	22546	40	20160609*
Euro OTC	Oxytetracycline ...	1602025-01	22658	40	AR-16-FG-014422-01
Euro OTC	Oxytetracycline ...	1602025	22669	40	20160609*
Euro OTC	Oxytetracycline ...	1602025-02	22839	40	20161021
Euro OTC	Oxytetracycline ...	1701034	23137	40	20170314*
Euro OTC	Oxytetracycline ...	1701035-02	23970	40	20170314

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 580 spectra of 14 reference samples from the substance/substance group *Oxytetracycline - hydrochloride*. These samples are listed above in the section *calibration samples*. The reference samples originate from 12 different batches.

- 71 853 spectra from a total of 1570 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 300 spectra from 10 reference samples of the substance/substance group *Oxytetracycline hydrochloride*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Oxytetracycline hydrochloride	12130001	20847†	20
Euro OTC	Oxytetracycline hydrochloride	1306022-02	21600†	20
Euro OTC	Oxytetracycline hydrochloride	1506037	21836†	20
Fagron	Oxytetracycline hydrochloride	15D29-B99-309066	21915†	20
Euro OTC	Oxytetracycline hydrochloride	1506037	21999†	20
Euro OTC	Oxytetracycline hydrochloride	1602025-02	22846	40
Fagron	Oxytetracycline hydrochloride	15L16-B02-322908	23226	40
Fagron	Oxytetracycline hydrochloride	15L16-B02-322908	23417	40
Caelo	Oxytetracycline hydrochloride	173168	23786	40
Euro OTC	Oxytetracycline hydrochloride	1801033	23971	40

- 161 773 spectra from a total of 3491 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 401 spectra from 143 *Apo-Ident* customers from 98 batches from the substance/substance group *Oxytetracycline hydrochloride*.

- These include spectra of independent samples from 88 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Oxytetracycline hydrochloride	5041402	1
Euro OTC	Oxytetracycline hydrochloride	1205028	1
Euro OTC	Oxytetracycline hydrochloride	1205028-02	16
Fagron	Oxytetracycline hydrochloride	912A-02865	1
Caelo	Oxytetracycline hydrochloride	12091405	1
Caelo	Oxytetracycline hydrochloride	12328103	2
Caelo	Oxytetracycline hydrochloride	12328107	1
Fagron	Oxytetracycline hydrochloride	12G10-N04	11
Euro OTC	Oxytetracycline hydrochloride	1306022	1
Euro OTC	Oxytetracycline hydrochloride	1306022-01	28
Euro OTC	Oxytetracycline hydrochloride	130602201	1
Euro OTC	Oxytetracycline hydrochloride	1306022-02	17
	Oxytetracycline hydrochloride	130602202	1
Euro OTC	Oxytetracycline hydrochloride	130602202	1
	Oxytetracycline hydrochloride	1306022-02	3
Euro OTC	Oxytetracycline hydrochloride	1306022-03	6
Fagron	Oxytetracycline hydrochloride	130602203	1
Fagron	Oxytetracycline hydrochloride	13I26-N11	1
Fagron	Oxytetracycline hydrochloride	13L19-B33	4
Caelo	Oxytetracycline hydrochloride	13L19-B33	1
Caelo	Oxytetracycline hydrochloride	13L19-B33-290730	1
Fagron	Oxytetracycline hydrochloride	13L19-B33-290730	3

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†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Supplier	Substance	Batch	Spectra
Fagron	Oxytetracycline hydrochloride	13L19-B33-290731	3
Fagropn	Oxytetracycline hydrochloride	13L19-B33-290731	1
Fagron	Oxytetracycline hydrochloride	14/22-B01-301465	2
Fagron	Oxytetracycline hydrochloride	13L19-B33-290732	1
Bombastus	Oxytetracycline hydrochloride	13L19-B33-290732	1
Euro OTC	Oxytetracycline hydrochloride	14070120-02	1
Fagron	Oxytetracycline hydrochloride	14/22-B01-301464	1
Fagron	Oxytetracycline hydrochloride		1
Euro OTC	Oxytetracycline hydrochloride	1407011202	1
Euro OTC	Oxytetracycline hydrochloride	1407012-01	12
	Oxytetracycline hydrochloride	140701201	1
Euro OTC	Oxytetracycline hydrochloride	1407012-02	14
Phönix Gotha	Oxytetracycline hydrochloride	1407012-02	1
Fagron	Oxytetracycline hydrochloride	1407012-01	1
Euro OTC	Oxytetracycline hydrochloride	1407012-03	6
Noweda	Oxytetracycline hydrochloride	140701202	1
Alliance	Oxytetracycline hydrochloride	1407012-03	1
Norbrook/Gehe	Oxytetracycline hydrochloride	140701203	1
Euro OTC	Oxytetracycline hydrochloride	140701203	1
Euro OTC	Oxytetracycline hydrochloride	1407012-09	1
Noweda	Oxytetracycline hydrochloride	140701203	1
Euro OTC	Oxytetracycline hydrochloride	14128003	2
Caelo	Oxytetracycline hydrochloride	14128003	1
Caelo	Oxytetracycline hydrochloride	14128004	1
Fagron	Oxytetracycline hydrochloride	14I22-B01	1
Fagron	Oxytetracycline hydrochloride	14I22-B01-301464	1
Fagron	Oxytetracycline hydrochloride	14I22-B01-301465	1
Caelo	Oxytetracycline hydrochloride	15060108	1
Fagro/Anzag	Oxytetracycline hydrochloride	14l22-B01-301464	1
Euro OTC	Oxytetracycline hydrochloride	15051507	1
Caelo	Oxytetracycline hydrochloride	15060109	6
Euro OTC	Oxytetracycline hydrochloride	15060109	2
Caesar&Loretz GmbH	Oxytetracycline hydrochloride	15060109	1
Anzag	Oxytetracycline hydrochloride	1506037	1
Euro OTC	Oxytetracycline hydrochloride	1506037	2
Euro OTC	Oxytetracycline hydrochloride	1506037-01	19
Caelo	Oxytetracycline hydrochloride	1506037	1
Caelo	Oxytetracycline hydrochloride	1506037-01	5
Euro OTC	Oxytetracycline hydrochloride	150603701	1
Norbrook Lab.Ltd.	Oxytetracycline hydrochloride	1506037-01	2
Anzag	Oxytetracycline hydrochloride	1506037-02	1
Laborchemie Apolda/Phönix	Oxytetracycline hydrochloride	1506037-02	1
Euro OTC	Oxytetracycline hydrochloride	1506037-02	22
Caelo	Oxytetracycline hydrochloride	1506037-02	1
Caelo	Oxytetracycline hydrochloride	150603702	1
Euro OTC	Oxytetracycline hydrochloride	1506037-03	13
Euro OTC	Oxytetracycline hydrochloride	150603703	1
Fagron	Oxytetracycline hydrochloride	15L16-B02-322907	1
Euro OTC	Oxytetracycline hydrochloride	15060377-01	1
Fagron	Oxytetracycline hydrochloride	15l16-b02-322907	1
Fagron	Oxytetracycline hydrochloride	15L16-B02-322908	1
Euro OTC	Oxytetracycline hydrochloride	1602025	2
Euro OTC	Oxytetracycline hydrochloride	1602025-01	14
Euro OTC	Oxytetracycline hydrochloride	160202501	1
Euro OTC	Oxytetracycline hydrochloride	1602025-02	11
Caelo	Oxytetracycline hydrochloride	1602025-02	2
Gehe	Oxytetracycline hydrochloride	1602025-02	2
Euro OTC	Oxytetracycline hydrochloride	160202502	1
Euro OTC	Oxytetracycline hydrochloride	1602025-1	1
Caelo	Oxytetracycline hydrochloride	16044007	1

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Supplier	Substance	Batch	Spectra
Caelo	Oxytetracycline hydrochloride	16077001	2
Caelo	Oxytetracycline hydrochloride	16077002	1
Caelo	Oxytetracycline hydrochloride	16077003	3
Caelo	Oxytetracycline hydrochloride	16077007	2
Caelo	Oxytetracycline hydrochloride	16077008	2
caesar	Oxytetracycline hydrochloride	16077008	2
Caelo	Oxytetracycline hydrochloride	16077011	1
Caelo	Oxytetracycline hydrochloride	16077009	1
Apomix/Kehr	Oxytetracycline hydrochloride	16077014	1
Caelo	Oxytetracycline hydrochloride	16077016	1
Caelo	Oxytetracycline hydrochloride	16340605	1
Euro OTC	Oxytetracycline hydrochloride	1701034-01	6
Euro OTC	Oxytetracycline hydrochloride	28011505	1
Fagron	Oxytetracycline hydrochloride	3-45703A	1
Fagron	Oxytetracycline hydrochloride	4-49732A-2	1
Euro OTC	Oxytetracycline hydrochloride	513E-02865	1
Euro OTC	Oxytetracycline hydrochloride	1011045-01	3
Spangropharm	Oxytetracycline hydrochloride	1111061-01	1
Euro OTC	Oxytetracycline hydrochloride	1111061-01	11
EuRho	Oxytetracycline hydrochloride	1111061-01	1
Euro OTC	Oxytetracycline hydrochloride	1111061-61	1
Gehe	Oxytetracycline hydrochloride	11336507	1
Caelo	Oxytetracycline hydrochloride	11336507	1
Caelo	Oxytetracycline hydrochloride	11336509	1
Gehe	Oxytetracycline hydrochloride	11336509	1
Caelo	Oxytetracycline hydrochloride	11336510	6
Fagron	Oxytetracycline hydrochloride	11D11-N04	1
Euro OTC	Oxytetracycline hydrochloride	12050-28	1
Euro OTC	Oxytetracycline hydrochloride	1205028-01	9
phönix, 24.01.2013	Oxytetracycline hydrochloride	1205028-01	1
Phönix	Oxytetracycline hydrochloride	1205028-01	1
EuRho	Oxytetracycline hydrochloride	1205028-01	2
Euro OTC	Oxytetracycline hydrochloride	120502801	1
Alliance Healthcare	Oxytetracycline hydrochloride	1205028-02	1
Euro OTC	Oxytetracycline hydrochloride	120502802	2
Alliance Healthcare	Oxytetracycline hydrochloride	1205222-01	1
Caelo	Oxytetracycline hydrochloride	12130001	3
Anzag	Oxytetracycline hydrochloride	12328103	1
Caesar & Loretz GmbH Hi...	Oxytetracycline hydrochloride	12328104	1
Caelo	Oxytetracycline hydrochloride	12328104	1
Fagron	Oxytetracycline hydrochloride	12A26-N05	7
Phönix Gotha	Oxytetracycline hydrochloride	1232814	1
Gehe	Oxytetracycline hydrochloride	12A26-N05	2
Caelo	Oxytetracycline hydrochloride	12G10-N04	3
Gehe	Oxytetracycline hydrochloride	12g10-n04	1
Caelo	Oxytetracycline hydrochloride	1306022-01	2
Fagron	Oxytetracycline hydrochloride	13D08-N11	10
Caelo	Oxytetracycline hydrochloride	13D08-N11	1
Fagron	Oxytetracycline hydrochloride	13L19-B33-29073	1
Caelo	Oxytetracycline hydrochloride	1407012-01	1
Caelo	Oxytetracycline hydrochloride	21021305	1
Caelo	Oxytetracycline hydrochloride	2-28230A	1
Euro OTC	Oxytetracycline hydrochloride	700116	1
Fagron	Oxytetracycline hydrochloride	C22H25CIN209	1
Gehe	Oxytetracycline hydrochloride	1205028-01	1
	Oxytetracycline hydrochloride		1
Gehe	Oxytetracycline hydrochloride	1306022-02	1

- 76 758 spectra from 463 *Apo-Ident* customers from a total of 25 453 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Oxytetracycline hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Oxytetracycline hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	580	0	71 853
Type B	0	300	0	161 773
Type C	0	388	13	76 758

The substance/substance group *Oxytetracycline hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9887 %)	100.0000 % (> 98.9655 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 98.0000 %)
Type C	100.0000 % (> 99.8849 %)	96.7581 % (> 96.0100 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20847	21999	7.89	34.72
20848	21836	11.96	33.91
21039	21600	6.63	37.37
21600	21600	0.00	37.99
21836	21836	0.00	33.08
21915	21836	15.93	34.15
21999	21999	0.00	36.35
22503	22503	0.00	35.46
22546	22546	0.00	32.61
22658	22658	0.00	31.22

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Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
22669	22669	0.00	32.72
22839	22503	10.95	34.67
23137	23137	0.00	30.97
23970	23137	7.81	31.63

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Pancreas powder**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20976-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Pancreas powder; Pancreatinum; Pancreatis pulvis

Special notes

When selecting the *Pancreas powder* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Pancreas powder*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Pancreas powder	13118902	20976	40	1402190
Caelo	Pancreas powder	13395203	21481	40	20131218
Caelo	Pancreas powder	161397	22482	40	20160527*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Pancreas powder*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 200 spectra from 6 reference samples of the substance/substance group *Pancreas powder*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Pancreas powder	10327501	20234	40
Caelo	Pancreas powder	13395203	21481†	20
Caelo	Pancreas powder	161397	22482†	20
Caelo	Pancreas powder	16139708	23757	40
Caelo	Pancreas powder	16139708	23758	40
Caelo	Pancreas powder	173226	23797	40

- 161 873 spectra from a total of 3494 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B*

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 6 spectra from 1 *Apo-Ident* customers from 4 batches from the substance/substance group *Pancreas powder*.

- These include spectra of independent samples from 4 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Pancreas powder	13118905	2
Caelo	Pancreas powder	150082111	1
Caelo	Pancreas powder	15082111	1
Caelo	Pancreas powder	15348705	2

- 77 153 spectra from 463 *Apo-Ident* customers from a total of 25 543 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Pancreas powder* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Pancreas powder* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	200	0	161 873
Type C	0	6	0	77 153

The substance/substance group *Pancreas powder* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 97.0000 %)
Type C	100.0000 % (> 99.8852 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to

exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20976	20976	0.00	26.76
21481	20976	13.84	30.64
22482	22482	0.00	30.16

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Papaverine hydrochloride**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20481-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Papaverine hydrochloride; Papaverini hydrochloridum; Papaverinum hydrochloricum

Special notes

When selecting the *Papaverine hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Papaverine hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Papaverine hydro…	13324310	21735	40	20130920
Caelo	Papaverine hydro…	123161	23054	40	20121127*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 80 spectra of 2 reference samples from the substance/substance group *Papaverine hydrochloride*. These samples are listed above in the section *calibration samples*. The reference samples originate from 2 different batches.

- 72 353 spectra from a total of 1580 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 180 spectra from 5 reference samples of the substance/substance group *Papaverine hydrochloride*.

- These include spectra of independent samples from 4 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Papaverine hydrochloride	09157221	20227	40
Fagron	Papaverine hydrochloride	11L05-N10	20481	40
Caelo	Papaverine hydrochloride	13324310	21735†	20
Caelo	Papaverine hydrochloride	163159	23053	40
Caelo	Papaverine hydrochloride	16315911	23928	40

- 161 893 spectra from a total of 3494 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B*

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 12 spectra from 10 *Apo-Ident* customers from 11 batches from the substance/substance group *Papaverine hydrochloride*.

- These include spectra of independent samples from 11 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Papaverine hydrochloride	12166105	1
Caelo	Papaverine hydrochloride	12316105	1
Phönix Gotha	Papaverine hydrochloride	13324306	1
Caelo	Papaverine hydrochloride	15160608	2
GATT-KOLLER/PHOENIX	Papaverine hydrochloride	2927/07131314	1
Phönix Gotha	Papaverine hydrochloride	9157221	1
Phönix Gotha	Papaverine hydrochloride	12166101	1
Caelo	Papaverine hydrochloride	12166112	1
Caelo	Papaverine hydrochloride	13324307	1
Caelo	Papaverine hydrochloride	91964419	1
Caelo	Papaverine hydrochloride		1

- 77 147 spectra from 463 *Apo-Ident* customers from a total of 25 536 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Papaverine hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Papaverine hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	72 353
Type B	0	180	0	161 893
Type C	0	10	2	77 147

The substance/substance group *Papaverine hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 96.6667 %)
Type C	100.0000 % (> 99.8851 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21735	23054	12.04	54.90
23054	23054	0.00	46.97

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Paracetamol**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20972-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Paracetamol; Paracetamolum

Special notes

When selecting the *Paracetamol* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Paracetamol*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Paracetamol	13D30-N03	20972	40	1402271
Fagron	Paracetamol	13D16-N08	20973	40	1402296
Fagron	Paracetamol	13G23-N03	20974	40	1402297
Euro OTC	Paracetamol	1111024-02	21598	40	20120123
Caelo	Paracetamol	15075706	22608	40	20150424

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 200 spectra of 5 reference samples from the substance/substance group *Paracetamol*. These samples are listed above in the section *calibration samples*. The reference samples originate from 5 different batches.

- 72 233 spectra from a total of 1577 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 180 spectra from 5 reference samples of the substance/substance group *Paracetamol*.

- These include spectra of independent samples from 4 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
zu erfassen	Paracetamol	`zu erfassen`	20160	40
Euro OTC	Paracetamol	1111024-02	21598†	20
Caelo	Paracetamol	15075707	22822	40
Caelo	Paracetamol	170284	23852	40
Caelo	Paracetamol	180830	24053	40

- 161 893 spectra from a total of 3495 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 40 spectra from 17 *Apo-Ident* customers from 27 batches from the substance/substance group *Paracetamol*.

- These include spectra of independent samples from 26 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Paracetamol	10325020	1
Caelo	Paracetamol	11300120	4
Caelo	Paracetamol	12G23-N04	1
Caelo	Paracetamol	13082005	1
Caelo	Paracetamol	13082010	3
Caelo	Paracetamol	13082008	1
Caelo	Paracetamol	13082011	1
Caelo	Paracetamol	15075704	5
Caelo	Paracetamol	13B05-N04	1
Caelo	Paracetamol	15075708	1
Caelo	Paracetamol	15217704	1
Caelo	Paracetamol	15217708	1
Caesar & Loretz GmbH	Paracetamol	15245901	1
Caelo	Paracetamol	15245901	1
Caelo	Paracetamol	15217710	1
Jenne	Paracetamol	15245901	1
Caelo	Paracetamol	15245902	2
Caelo	Paracetamol	1814U-02045	1
Caelo	Paracetamol	1912M-02045	1
Caelo	Paracetamol	2815I-02045	1
Caelo	Paracetamol	10065102	1
Caelo	Paracetamol	10325017	1
Caelo	Paracetamol	10325018	1
Euro OTC	Paracetamol	1111024-01	1
Euro OTC	Paracetamol	1111024-02	1
Caelo	Paracetamol	11300108	1
Caelo	Paracetamol	11300113	2
Caelo	Paracetamol	Paracetamol1	1
Caelo	Paracetamol	Paracetamol2	1

- 77 119 spectra from 463 *Apo-Ident* customers from a total of 25 520 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Paracetamol* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Paracetamol* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	200	0	72 233
Type B	0	164	16	161 893
Type C	0	32	8	77 119

The substance/substance group *Paracetamol* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9928 %)	91.1111 % (> 89.4444 %)
Type C	100.0000 % (> 99.8850 %)	80.0000 % (> 72.5000 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20972	20972	0.00	59.56
20973	20973	0.00	59.73
20974	20974	0.00	57.15
21598	20972	2.20	59.67
22608	20972	15.66	52.07

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Patent blue V, E131**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20469-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Patent blue V, E131

Special notes

When selecting the *Patent blue V, E131* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Patent blue V, E131*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Patent blue V, E...	12364206	21384	40	1508043
Caelo	Patent blue V, E...	12364206	21385	40	20130110
Caelo	Patent blue V, E...	13351803	21695	40	20131114
Caelo	Patent blue V, E...	13351807	22387	40	1702362
Caelo	Patent blue V, E...	16306902	23215	40	20161220

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 200 spectra of 5 reference samples from the substance/substance group *Patent blue V, E131*. These samples are listed above in the section *calibration samples*. The reference samples originate from 4 different batches.

- 72 233 spectra from a total of 1578 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 140 spectra from 4 reference samples of the substance/substance group *Patent blue V, E131*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Patent blue V, E131	10379902	20209	40
Caelo	Patent blue V, E131	11138401	20469	40
Caelo	Patent blue V, E131	13351803	21695†	20
Caelo	Patent blue V, E131	16306902	23214	40

- 161 933 spectra from a total of 3495 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 22 spectra from 20 *Apo-Ident* customers from 12 batches from the substance/substance group *Patent blue V, E131*.

- These include spectra of independent samples from 9 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Patent blue V, E131	12364206	4
Caelo	Patent blue V, E131	11305303	3
Caelo	Patent blue V, E131	13351807	5
Caelo	Patent blue V, E131	13351808	2
Noweda	Patent blue V, E131	11138402	1
Caelo	Patent blue V, E131	15060204	1
Caelo	Patent blue V, E131	11305302	1
Noweda	Patent blue V, E131	10273001	1
Caelo	Patent blue V, E131	12364202	1
Caelo	Patent blue V, E131	13351803	1
Caelo	Patent blue V, E131	12364204	1
Caelo	Patent blue V, E131		1

- 77 137 spectra from 463 *Apo-Ident* customers from a total of 25 535 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Patent blue V, E131* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Patent blue V, E131* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	200	0	72 233
Type B	0	140	0	161 933
Type C	0	21	1	77 137

The substance/substance group *Patent blue V, E131* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 95.7143 %)
Type C	100.0000 % (> 99.8850 %)	95.4545 % (> 81.8182 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several

new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21384	21384	0.00	105.98
21385	21384	1.18	105.09
21695	22387	22.13	110.44
22387	22387	0.00	110.74
23215	21384	25.04	95.15

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Phenazone**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	22532-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Phenazone; Phenazonum; Phenyldimethylpyrazolonum

Special notes

When selecting the *Phenazone* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Phenazone*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Phenazone	13G16-B07-287172	22532	40	AR-16-FG-011360-01
Caelo	Phenazone	15415107	22827	40	20151215

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 80 spectra of 2 reference samples from the substance/substance group *Phenazone*. These samples are listed above in the section *calibration samples*. The reference samples originate from 2 different batches.

- 72 353 spectra from a total of 1580 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 120 spectra from 3 reference samples of the substance/substance group *Phenazone*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Phenazone	15415101	22576	40
Fagron	Phenazone	13G16-B07-287172	22720	40
Caelo	Phenazone	170836	23302	40

- 161 953 spectra from a total of 3496 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

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- 0 spectra from 0 *Apo-Ident* customers from 0 batches from the substance/substance group *Phenazone*.

- These include spectra of independent samples from 0 batches, of which no spectra have been used for the generation of the database.

- 77 159 spectra from 463 *Apo-Ident* customers from a total of 25 547 batches from a further 701 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Phenazone* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Phenazone* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	72 353
Type B	0	120	0	161 953
Type C	0	0	0	77 159

The substance/substance group *Phenazone* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 95.0000 %)
Type C	100.0000 % (> 99.8849 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
22532	22532	0.00	42.78
22827	22532	8.08	37.50

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Pheniramine maleate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20694-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Pheniramine maleate; Pheniramini maleas; Pheniraminum maleinicum

Special notes

When selecting the *Pheniramine maleate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Pheniramine maleate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Pheniramine male…	12200502	20694	40	1401559
Euro OTC	Pheniramine male…	1109013-02	20756	40	20111122
Fagron	Pheniramine male…	13D24-N04	20928	40	20130530

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Pheniramine maleate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 120 spectra from 3 reference samples of the substance/substance group *Pheniramine maleate*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Pheniramine maleate	15172702	22790	40
Euro OTC	Pheniramine maleate	1701021	23384	40
Caelo	Pheniramine maleate	173167	23821	40

- 161 953 spectra from a total of 3496 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

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- 24 spectra from 16 *Apo-Ident* customers from 19 batches from the substance/substance group *Pheniramine maleate*.

- These include spectra of independent samples from 19 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Pheniramine maleate	14C25-B01-302272	1
Fagron	Pheniramine maleate	14C25-B01-295293	3
Euro OTC	Pheniramine maleate	1209032-01	2
Cealo	Pheniramine maleate	12352608	1
Caelo	Pheniramine maleate	12352602	1
Euro OTC	Pheniramine maleate	1411044-02	1
Euro OTC	Pheniramine maleate	1411044-01	1
Supriya LifeScience Ltd...	Pheniramine maleate	14C25-B01	1
Caelo	Pheniramine maleate	14C25-B01-292540	1
Fagron	Pheniramine maleate	14C25-B01-292540	1
Fagron	Pheniramine maleate	14C25-B01-29540	1
Fagron	Pheniramine maleate	14C25-B01-307150	1
Fagron	Pheniramine maleate	14c25-b01-307150	1
Supriya LifeScience Ltd...	Pheniramine maleate	SLL/P/1213063	1
Fagron	Pheniramine maleate	14c25b01307150	1
Caelo	Pheniramine maleate	12352604	1
Caelo	Pheniramine maleate	9276210	1
Fagron	Pheniramine maleate	12I06-N02	1
Alliance Healthcare	Pheniramine maleate	12L04-N05	1
Fagron	Pheniramine maleate	12L04-N05	1
Fagron	Pheniramine maleate	32/06-N02	1

- 77 135 spectra from 463 *Apo-Ident* customers from a total of 25 528 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Pheniramine maleate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Pheniramine maleate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	120	0	161 953
Type C	0	22	2	77 135

The substance/substance group *Pheniramine maleate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 95.0000 %)
Type C	100.0000 % (> 99.8850 %)	91.6667 % (> 79.1667 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20694	20694	0.00	54.01
20756	20694	17.08	55.28
20928	20694	8.96	51.89

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Phenylbutazon**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20447-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Phenylbutazon; Phenylbutazonum

Special notes

When selecting the *Phenylbutazon* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Phenylbutazon*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Phenylbutazon	14057202	21379	40	20140321
Euro OTC	Phenylbutazon	1305050-02	21605	40	AR-15-FG-005687-01
Euro OTC	Phenylbutazon	1507023	21855	40	20150805*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Phenylbutazon*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 180 spectra from 5 reference samples of the substance/substance group *Phenylbutazon*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Phenylbutazon	102629010	20447	40
Euro OTC	Phenylbutazon	1305050-02	21605†	20
Euro OTC	Phenylbutazon	1507023	21855†	20
Caelo	Phenylbutazon	161121	22471	60
Euro OTC	Phenylbutazon	1604033	22563	40

- 161 893 spectra from a total of 3494 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B*

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 3 spectra from 3 *Apo-Ident* customers from 3 batches from the substance/substance group *Phenylbutazon*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Phenylbutazon	10262901	1
Caelo	Phenylbutazon	15218502	1
Fagron	Phenylbutazon	11H26-N02	1

- 77 156 spectra from 463 *Apo-Ident* customers from a total of 25 544 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Phenylbutazon* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Phenylbutazon* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	180	0	161 893
Type C	0	3	0	77 156

The substance/substance group *Phenylbutazon* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 96.6667 %)
Type C	100.0000 % (> 99.8854 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to

exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21379	21855	3.77	46.91
21605	21605	0.00	45.21
21855	21855	0.00	44.82

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Phenylephrine hydrochloride**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20567-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Phenylephrine hydrochloride; Phenylephrini hydrochloridum; Phenylephrinum hydrochloricum

Special notes

When selecting the *Phenylephrine hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Phenylephrine hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Phenylephrine hy…	12J19-B40-288254	21051	40	20131210
Fagron	Phenylephrine hy…	14H13-B02-308438	21960	40	AR-16-FG-008920-01
Fagron	Phenylephrine hy…	16A20-B07-317987	22388	40	AR-16-FG-013385-01
Euro OTC	Phenylephrine hy…	1704009	23394	40	20170524*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 4 reference samples from the substance/substance group *Phenylephrine hydrochloride*. These samples are listed above in the section *calibration samples*. The reference samples originate from 4 different batches.

- 72 273 spectra from a total of 1578 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 180 spectra from 5 reference samples of the substance/substance group *Phenylephrine hydrochloride*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Phenylephrine hydrochloride	11L22-N10	20567	40
Fagron	Phenylephrine hydrochloride	11L22-N10	20594	40
Fagron	Phenylephrine hydrochloride	14H13-B02-308438	21960†	20
Fagron	Phenylephrine hydrochloride	17C23-B04-333878	23263	40
Fagron	Phenylephrine hydrochloride	17C23-B04-333880	23267	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 893 spectra from a total of 3495 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 41 spectra from 11 *Apo-Ident* customers from 28 batches from the substance/substance group *Phenylephrine hydrochloride*.

- These include spectra of independent samples from 27 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Phenylephrine hydrochloride	10091504	1
Fagron	Phenylephrine hydrochloride	12J19-B40-288253	2
Fagron	Phenylephrine hydrochloride	13K25-B02-293844	3
Phoenix	Phenylephrine hydrochloride	14H13-B02	2
Fagron	Phenylephrine hydrochloride	13K25-B02-293845	1
Fagron	Phenylephrine hydrochloride	14H13-B02-299814	1
Fagron	Phenylephrine hydrochloride	14H13-B02-299816	3
Fagron	Phenylephrine hydrochloride	14H13B02-299817	1
Fagron	Phenylephrine hydrochloride	14H13B02299817	1
Caelo	Phenylephrine hydrochloride	14H13-B02-308438	1
Fagron	Phenylephrine hydrochloride	14H13-B02-309892	3
Phoenix	Phenylephrine hydrochloride	15F09-B08	1
Fagron	Phenylephrine hydrochloride	17C23-B04-333880	1
Fagron	Phenylephrine hydrochloride	15F09-B08-316796	1
Fagron	Phenylephrine hydrochloride	17c23-b04-333880	1
Fagron	Phenylephrine hydrochloride	16A20-B07-323398	1
Fagron	Phenylephrine hydrochloride	1021402	1
Fagron	Phenylephrine hydrochloride	12A03-N09	1
Fagron	Phenylephrine hydrochloride	12C08-N17	1
Noweda	Phenylephrine hydrochloride	12F01-N20	2
Fagron	Phenylephrine hydrochloride	12F01-N20	1
Fagron	Phenylephrine hydrochloride	12g19-n04	1
Fagron	Phenylephrine hydrochloride	12G19-N04	1
Fagron	Phenylephrine hydrochloride	13A03-N09	4
Fagron	Phenylephrine hydrochloride	13a03-n09	1
Fagron	Phenylephrine hydrochloride	13G10-N04	1
Fagron	Phenylephrine hydrochloride	13D09-N02	1
Fagron	Phenylephrine hydrochloride	13B14-N03	1
Fagron	Phenylephrine hydrochloride	CH12F01-N20	1

- 77 118 spectra from 463 *Apo-Ident* customers from a total of 25 520 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Phenylephrine hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Phenylephrine hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	160	0	72 273
Type B	0	160	20	161 893
Type C	0	40	1	77 118

The substance/substance group *Phenylephrine hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9928 %)	88.8889 % (> 87.2222 %)
Type C	100.0000 % (> 99.8850 %)	97.5610 % (> 90.2439 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21051	21960	2.32	30.62
21960	21960	0.00	31.39
22388	22388	0.00	30.06
23394	23394	0.00	31.96

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Phenytoin**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20949-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Phenytoin; Diphenylhydrantoinum; Phenytoinum

Special notes

When selecting the *Phenytoin* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Phenytoin*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Phenytoin	13G26-N02	20949	40	1401380
Fagron	Phenytoin	15E12-B05-312661	22271	30	20150519

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 70 spectra of 2 reference samples from the substance/substance group *Phenytoin*. These samples are listed above in the section *calibration samples*. The reference samples originate from 2 different batches.

- 72 363 spectra from a total of 1580 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 175 spectra from 5 reference samples of the substance/substance group *Phenytoin*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Phenytoin	12I07-N02	20678	40
Fagron	Phenytoin	15E12-B05-312661	22271†	15
Fagron	Phenytoin	16C14-B06-325086	23110	40
Fagron	Phenytoin	16C14-B06-325086	23377	40
Fagron	Phenytoin	17L22-B04-345861	23994	40

- 161 898 spectra from a total of 3495 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 3 spectra from 2 *Apo-Ident* customers from 3 batches from the substance/substance group *Phenytoin*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Phenytoin	12C27N13	1
Fagron	Phenytoin	12I07-N02	1
Fagron	Phenytoin	13G26-N02	1

- 77 156 spectra from 463 *Apo-Ident* customers from a total of 25 544 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Phenytoin* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Phenytoin* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	70	0	72 363
Type B	0	175	0	161 898
Type C	0	3	0	77 156

The substance/substance group *Phenytoin* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 91.4286 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 96.5714 %)
Type C	100.0000 % (> 99.8854 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20949	20949	0.00	96.11
22271	20949	5.93	98.09

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Pilocarpine hydrochloride**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	21519-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Pilocarpine hydrochloride; Pilocarpini hydrochloridum; Pilocarpinum hydrochloricum

Special notes

When selecting the *Pilocarpine hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Pilocarpine hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Pilocarpine hydr…	12217319	21519	40	1501660
Euro OTC	Pilocarpine hydr…	1305044-01	21629	40	20130725
Euro OTC	Pilocarpine hydr…	1603047	22553	40	20160429*
Caelo	Pilocarpine hydr…	17124208	23371	40	20170607
Euro OTC	Pilocarpine hydr…	1305044-01	21629SI	40	20130725
Euro OTC	Pilocarpine hydr…	1603047	22553SI	40	20160429*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 240 spectra of 6 reference samples from the substance/substance group *Pilocarpine hydrochloride*. These samples are listed above in the section *calibration samples*. The reference samples originate from 4 different batches.

- 72 193 spectra from a total of 1578 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 420 spectra from 11 reference samples of the substance/substance group *Pilocarpine hydrochloride*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Pilocarpine hydrochloride	09234907	20105	40
Caelo	Pilocarpine hydrochloride	12217319	21518	60
Caelo	Pilocarpine hydrochloride	12217319	21519†	20
Euro OTC	Pilocarpine hydrochloride	1305044-01	21629†	20
Caelo	Pilocarpine hydrochloride	171595	23337	40
Caelo	Pilocarpine hydrochloride	171242	23338	40
Caelo	Pilocarpine hydrochloride	12217319	21518SI	60
Euro OTC	Pilocarpine hydrochloride	1305044-01	21629SI†	20
Caelo	Pilocarpine hydrochloride	171595	23337SI	40
Caelo	Pilocarpine hydrochloride	171242	23338SI	40
Caelo	Pilocarpine hydrochloride	17124208	23371SI	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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- 161 653 spectra from a total of 3493 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 37 spectra from 31 *Apo-Ident* customers from 23 batches from the substance/substance group *Pilocarpine hydrochloride*.

- These include spectra of independent samples from 21 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Euro OTC	Pilocarpine hydrochloride	1202031-02	2
Caelo	Pilocarpine hydrochloride	12217316	1
Euro OTC	Pilocarpine hydrochloride	13050-14-01	1
Euro OTC	Pilocarpine hydrochloride	1305044-01	5
Euro OTC	Pilocarpine hydrochloride	130504401	2
Euro OTG	Pilocarpine hydrochloride	1305044-01	1
Euro OTC	Pilocarpine hydrochloride	1305044-03	2
Caelo	Pilocarpine hydrochloride	1305044-03	1
Fagron	Pilocarpine hydrochloride	13H24-N03	1
Gehe	Pilocarpine hydrochloride	15198610	1
Euro OTC	Pilocarpine hydrochloride	1603047-01	3
Leyhs	Pilocarpine hydrochloride	15198701	1
Caelo	Pilocarpine hydrochloride	17124208	2
Noweda	Pilocarpine hydrochloride	11037801	1
Noweda	Pilocarpine hydrochloride	10CD04	1
Caelo	Pilocarpine hydrochloride	17236401	1
Caelo	Pilocarpine hydrochloride	1116190	1
Euro OTC	Pilocarpine hydrochloride	1202031-01	1
Caelo	Pilocarpine hydrochloride	12217307	1
Caelo	Pilocarpine hydrochloride	12217302	1
Sanacorp	Pilocarpine hydrochloride	12217302	1
Caelo	Pilocarpine hydrochloride	12K07-N09	1
Caelo	Pilocarpine hydrochloride	130504401	1
Caelo	Pilocarpine hydrochloride	25051303	1
Caelo	Pilocarpine hydrochloride	2211112032607	1
Euro OTC	Pilocarpine hydrochloride	2909041V-02	1
Euro OTC	Pilocarpine hydrochloride	Euroo	1

- 77 122 spectra from 463 *Apo-Ident* customers from a total of 25 524 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model,

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Pilocarpine hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Pilocarpine hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	240	0	72 193
Type B	0	413	7	161 653
Type C	0	31	6	77 122

The substance/substance group *Pilocarpine hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.5000 %)
Type B	100.0000 % (> 99.9928 %)	98.3333 % (> 97.6190 %)
Type C	100.0000 % (> 99.8850 %)	83.7838 % (> 75.6757 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21519	21519	0.00	36.60
21629	21519	5.63	39.47
22553	22553	0.00	36.38
23371	21519	5.03	40.19

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Poloxamers 407**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20540-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Poloxamers 407; Poloxamera

Special notes

When selecting the *Poloxamers 407* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Poloxamers 407*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Poloxamers 407	14196101	21652	40	AR-14-FG-013090-01
Fagron	Poloxamers 407	14G17-B03-296866	21726	40	20140806
Caelo	Poloxamers 407	16242605	23257	40	20160915

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Poloxamers 407*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 240 spectra from 7 reference samples of the substance/substance group *Poloxamers 407*.

- These include spectra of independent samples from 4 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Poloxamers 407	12044205	20540	40
Caelo	Poloxamers 407	12044205	20568	40
Caelo	Poloxamers 407	12044202	20607	40
Caelo	Poloxamers 407	14196101	21652†	20
Fagron	Poloxamers 407	14G17-B03-296866	21726†	20
Caelo	Poloxamers 407	170486	23311	40
Caelo	Poloxamers 407	172921	23810	40

- 161 833 spectra from a total of 3493 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 45 spectra from 27 *Apo-Ident* customers from 29 batches from the substance/substance group *Poloxamers 407*.

- These include spectra of independent samples from 28 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Poloxamers 407	315E-07027	1
Caelo	Poloxamers 407	12286806	1
Fagron	Poloxamers 407	914I-07027	1
Caelo	Poloxamers 407	13133203	2
Fagron	Poloxamers 407	13G29-NO1	1
Caelo	Poloxamers 407	13133207	1
Sanacorp	Poloxamers 407	14196101	2
Caelo	Poloxamers 407	14196101	2
Caelo	Poloxamers 407	14196104	1
Caelo	Poloxamers 407	14196105	1
Caelo	Poloxamers 407	14196108	3
Caelo	Poloxamers 407	14359501	1
Caesar & Loretz GmbH	Poloxamers 407	15183102	1
Fagron	Poloxamers 407	15183103	1
Caelo	Poloxamers 407	15397802	5
Caelo	Poloxamers 407	15397803	1
Fagron	Poloxamers 407	15A26-B03-303503	1
Caelo	Poloxamers 407	16189302	4
Caelo	Poloxamers 407	17292101	2
Caelo	Poloxamers 407	16242601	1
Fagron	Poloxamers 407	5315I-07027	1
Fagron	Poloxamers 407	WPWI610C	1
Caelo	Poloxamers 407	AKD16	1
Phonix	Poloxamers 407	12/13-N10	1
Caelo	Poloxamers 407	12286801	2
Caelo	Poloxamers 407	12286805	1
Fagron	Poloxamers 407	12K23-N03	1
Caelo	Poloxamers 407	13133201	1
Noweda	Poloxamers 407	13133201	1
Fagron	Poloxamers 407	5211Q-07027	1
Fagron	Poloxamers 407	13G29-N01	1

- 77 114 spectra from 463 *Apo-Ident* customers from a total of 25 518 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Poloxamers 407* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Poloxamers 407* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following

table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	240	0	161 833
Type C	0	42	3	77 114

The substance/substance group *Poloxamers 407* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 97.5000 %)
Type C	100.0000 % (> 99.8850 %)	93.3333 % (> 86.6667 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21652	21652	0.00	46.83
21726	21652	4.10	44.74
23257	21652	3.54	48.62

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Polymyxin B sulfate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20853-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Polymyxin B sulfate; Polymixinum-B-sulfuricum; Polymyxin B sulphate; Polymyxini B sulfas

Special notes

When selecting the *Polymyxin B sulfate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Polymyxin B sulfate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Polymyxin B sulf…	13C12-N02	20853	40	1402691
Euro OTC	Polymyxin B sulf…	1304033-01	21094	39	20130829
Fagron	Polymyxin B sulf…	12G13-N05	21258	40	1410347
Euro OTC	Polymyxin B sulf…	1202039-02	21329	40	1411033
Euro OTC	Polymyxin B sulf…	1304033-02	21584	40	20130612

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Polymyxin B sulf…	13I13-N05	21595	40	AR-15-FG-001516-01
Fagron	Polymyxin B sulf…	14F04-B03-296722	21957	40	20140708
Euro OTC	Polymyxin B sulf…	1505005-01	21980	40	AR-16-FG-005387-01
Fagron	Polymyxin B sulf…	15H14-B01-314364	22323	40	20150902
Caelo	Polymyxin B sulf…	153501	22451	40	20160318*
Euro OTC	Polymyxin B sulf…	1604016	22542	40	20160509*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 439 spectra of 11 reference samples from the substance/substance group *Polymyxin B sulfate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 11 different batches.

- 71 994 spectra from a total of 1571 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 321 spectra from 12 reference samples of the substance/substance group *Polymyxin B sulfate*.

- These include spectra of independent samples from 4 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Polymyxin B sulfate	1202039-02	20904	40
Fagron	Polymyxin B sulfate	13E06-N12	20912	40
Euro OTC	Polymyxin B sulfate	1304033-01	21094†	1

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*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Polymyxin B sulfate	1304033-02	21584†	20
Fagron	Polymyxin B sulfate	13I13-N05	21595†	20
Fagron	Polymyxin B sulfate	14F04-B03-296722	21957†	20
Euro OTC	Polymyxin B sulfate	1505005-01	21980†	20
Fagron	Polymyxin B sulfate	15H14-B01-314364	22323†	20
Caelo	Polymyxin B sulfate	153501	22451†	20
Euro OTC	Polymyxin B sulfate	1701010	23012	40
Euro OTC	Polymyxin B sulfate	1707013	23554	40
Euro OTC	Polymyxin B sulfate	1802006	23953	40

- 161 752 spectra from a total of 3487 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 63 spectra from 47 *Apo-Ident* customers from 34 batches from the substance/substance group *Polymyxin B sulfate*.

- These include spectra of independent samples from 29 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Polymyxin B sulfate	912A-03315	1
Caelo	Polymyxin B sulfate	1102013-01	1
Euro OTC	Polymyxin B sulfate	11091419	1
Rondell Apotheke	Polymyxin B sulfate	121161	1
Fagron	Polymyxin B sulfate	12G13-N05	1
Fagron	Polymyxin B sulfate	13/13-N05	1
Euro OTC	Polymyxin B sulfate	1304033-01	2
Großhandel	Polymyxin B sulfate	1304033-02	1
Euro OTC	Polymyxin B sulfate	1304033-02	1
Caelo	Polymyxin B sulfate	130403302	1
Euroo/Phoenix	Polymyxin B sulfate	1304033-02	1
Caelo	Polymyxin B sulfate	1304033-03	1
Euro OTC	Polymyxin B sulfate	1304033-03	1
Euro OTC	Polymyxin B sulfate	130416	2
Fagron	Polymyxin B sulfate	13G05-N06	2
Caelo	Polymyxin B sulfate	13H28-B02-287953	1
Fagron	Polymyxin B sulfate	13H28-B02-287954	1
Euro OTC	Polymyxin B sulfate	1406012-01	3
Euro OTC	Polymyxin B sulfate	1406012-02	3
Euro OTC	Polymyxin B sulfate	140601202	2
Fagron	Polymyxin B sulfate	14F04-B03-296721	1
Euro OTC	Polymyxin B sulfate	1505005-01	5

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†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Supplier	Substance	Batch	Spectra
Euro OTC	Polymyxin B sulfate	150500501	1
Euro OTC	Polymyxin B sulfate	1604016-01	1
Caelo	Polymyxin B sulfate	1604016-01	2
Bombastus	Polymyxin B sulfate	1604016-02	1
Euro OTC	Polymyxin B sulfate	1604016-02	1
Fagron	Polymyxin B sulfate	16C01-B04	2
Fagron	Polymyxin B sulfate	16C01-B04-322012	1
Euro OTC	Polymyxin B sulfate	1701010-01	2
Caelo	Polymyxin B sulfate	170101001	1
Phönix	Polymyxin B sulfate	1701010-01	1
Euro OTC	Polymyxin B sulfate	23051502	1
Anzag	Polymyxin B sulfate	11K28-N07	1
Euro OTC	Polymyxin B sulfate	1202039-01	1
EuRho	Polymyxin B sulfate	1202039-01	1
Phönix	Polymyxin B sulfate	1202039-01	1
Euro OTC	Polymyxin B sulfate	1202039-02	4
Alliance Healthcare	Polymyxin B sulfate	1202039-02	1
euroct/gehe	Polymyxin B sulfate	1202039-02	1
Fagron	Polymyxin B sulfate	12D05-N01	1
phönix,24.01.2013	Polymyxin B sulfate	12D05-N01	1
Fagron	Polymyxin B sulfate	12G25-N06	1
Euro OTC	Polymyxin B sulfate	25101201	1
Fagron	Polymyxin B sulfate	13H28-B02-87953	1

- 77 096 spectra from 463 *Apo-Ident* customers from a total of 25 514 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Polymyxin B sulfate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Polymyxin B sulfate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	439	0	71 994
Type B	0	304	17	161 752
Type C	0	56	7	77 096

The substance/substance group *Polymyxin B sulfate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9887 %)	100.0000 % (> 98.6333 %)
Type B	100.0000 % (> 99.9928 %)	94.7040 % (> 93.7695 %)
Type C	100.0000 % (> 99.8850 %)	88.8889 % (> 84.1270 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several

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new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20853	20853	0.00	20.94
21094	21980	2.80	25.38
21258	21258	0.00	22.93
21329	21329	0.00	22.63
21584	21980	3.61	24.52
21595	21595	0.00	24.83
21957	21329	12.26	27.29
21980	21980	0.00	23.54
22323	21980	7.00	25.30
22451	22451	0.00	32.90
22542	22542	0.00	20.84

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Potassium citrate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20021-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Potassium citrate; Kalii citras; Kalii citricum

Special notes

When selecting the *Potassium citrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Potassium citrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Potassium citrate	11320212	20655	40	20111201
Caelo	Potassium citrate	13317618	21452	40	20130926
Caelo	Potassium citrate	15123103	21775	40	20150414
Euro OTC	Potassium citrate	1509044	21936	40	20151013*
Caelo	Potassium citrate	161130	22476	40	20160602*
Euro OTC	Potassium citrate	1611017	22921	40	20161207*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 240 spectra of 6 reference samples from the substance/substance group *Potassium citrate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 6 different batches.

- 72 193 spectra from a total of 1576 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 461 spectra from 13 reference samples of the substance/substance group *Potassium citrate*.

- These include spectra of independent samples from 9 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Potassium citrate	83305269	20021	61
Caelo	Potassium citrate	11102206	20502	40
Euro OTC	Potassium citrate	1204016-01	20575	40
Caelo	Potassium citrate	13317618	21452†	20
Caelo	Potassium citrate	15123103	21775†	20
Euro OTC	Potassium citrate	1509044	21936†	20
Caelo	Potassium citrate	161130	22476†	20
Euro OTC	Potassium citrate	1603040	22521	40
Euro OTC	Potassium citrate	1606041	22676	40
Caelo	Potassium citrate	170929	23290	40
Euro OTC	Potassium citrate	1705024	23428	40
Caelo	Potassium citrate	180385	24046	40
Euro OTC	Potassium citrate	1803003	24084	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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- 161 612 spectra from a total of 3486 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 305 spectra from 120 *Apo-Ident* customers from 114 batches from the substance/substance group *Potassium citrate*.

- These include spectra of independent samples from 110 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Potassium citrate	1603040-01	1
Caelo	Potassium citrate	14138105	6
Caelo	Potassium citrate	1215309	1
Caelo	Potassium citrate	12299207	5
Caelo	Potassium citrate		16
Caelo	Potassium citrate	11320202	2
Caelo	Potassium citrate	13135907	4
Gutenberg-Apotheke	Potassium citrate	13135907	1
Caelo	Potassium citrate	1234	5
Caelo	Potassium citrate	13080602	9
Caelo	Potassium citrate	12135302	6
Caelo	Potassium citrate	5021509	1
Caelo	Potassium citrate	12299203	4
Testsubstanz	Potassium citrate		1
Caelo	Potassium citrate	12334	1
Euro OTC	Potassium citrate	123456	6
Labor	Potassium citrate	1234	2
Caelo	Potassium citrate	1234Test	1
Caelo	Potassium citrate	123Test	3
Caelo	Potassium citrate	12345678	2
Caelo	Potassium citrate	123654879	1
Caelo	Potassium citrate	123test	2
Caelo	Potassium citrate	12648	1
Caelo	Potassium citrate	12456	1
Caelo	Potassium citrate	123Testmessung	1
Caelo	Potassium citrate	13080603	2
Euro OTC	Potassium citrate	1311036-01	10
Caelo	Potassium citrate	1311036-01	2
EuRho/Phönix	Potassium citrate	1311036-01	1
Caelo	Potassium citrate	13135902	1
Caelo	Potassium citrate	13135908	2
Phoenix	Potassium citrate	1326PLV-1739	1
Caelo	Potassium citrate	13317602	5
Caelo	Potassium citrate	13317603	4
Caelo	Potassium citrate	13317613	3

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[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Supplier	Substance	Batch	Spectra
Caelo	Potassium citrate	13317604	2
Caelo	Potassium citrate	13317617	2
Phoenix Goettin	Potassium citrate	13317613	1
Caelo	Potassium citrate	13317618	4
Caelo	Potassium citrate	13317619	3
Phoenix 08.07.2014	Potassium citrate	13317624	1
Euro OTC	Potassium citrate	1406025-01	2
Euro OTC	Potassium citrate	1410014-01	4
Caelo	Potassium citrate	14138107	2
Caelo	Potassium citrate	14138112	2
Caelo	Potassium citrate	14138118	3
Caelo	Potassium citrate	14138119	1
Caelo	Potassium citrate	1413812	1
Berkel AHK	Potassium citrate	1438105	1
Euro OTC	Potassium citrate	1504024-01	3
Euro OTC	Potassium citrate	1509044-01	4
Caelo	Potassium citrate	15123102	2
Caelo	Potassium citrate	15123103	2
Caelo	Potassium citrate	15148701	4
Phönix	Potassium citrate	15123103	1
Caelo	Potassium citrate	15148706	4
Caelo	Potassium citrate	15148702	1
Phoenix	Potassium citrate	15148708	1
Caelo	Potassium citrate	15435701	2
Caelo	Potassium citrate	15148707	3
Caelo	Potassium citrate	15435709	2
Caelo	Potassium citrate	154357025	1
Caelo	Potassium citrate	15435710	2
Caelo	Potassium citrate	1543702	1
Euro OTC	Potassium citrate	1603040-01	12
Euro OTC	Potassium citrate	160601-01	1
Euro OTC	Potassium citrate	160604-01	1
Euro OTC	Potassium citrate	1606041-01	4
Euro OTC	Potassium citrate	1611017-01	3
Caelo	Potassium citrate	16113002	1
Caelo	Potassium citrate	16113007	1
Caelo	Potassium citrate	16113003	1
Caelo	Potassium citrate	3012Q-01737	1
Caelo	Potassium citrate	189645	1
Caelo	Potassium citrate	2114M1737	1
Caelo	Potassium citrate	17061402	1
Caelo	Potassium citrate	83305269	1
Euro OTC	Potassium citrate		1
ACM	Potassium citrate	KNC0196J15	4
Caelo	Potassium citrate	70913Kaci	1
Caelo	Potassium citrate	9259120	1
Caelo	Potassium citrate	9259107	1
lohmann	Potassium citrate	1051470	1
Klenk	Potassium citrate	11102219	1
Caelo	Potassium citrate	11102201	1
Caelo	Potassium citrate	10067413	1
Caelo	Potassium citrate	1112008-01	1
Caelo	Potassium citrate	11320201	1
Caelo	Potassium citrate	11320203	2
Caelo	Potassium citrate	11320212	5
Caelo	Potassium citrate	11320213	2
Fagron	Potassium citrate	1204016-01	2
Euro OTC	Potassium citrate	1204016-01	4
Sanacorp/ euRho	Potassium citrate	1204016-01	1
Caelo	Potassium citrate	1204016-01	1

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Supplier	Substance	Batch	Spectra
Euro OTC	Potassium citrate	1209005-01	3
Euro OTC	Potassium citrate	1211006-01	3
Phönix	Potassium citrate	1211006-01	1
Caelo	Potassium citrate	1213503	1
Erika apotheke	Potassium citrate	12135301	2
phönix,10.12.12	Potassium citrate	12135302	1
Erika apotheke	Potassium citrate	12135306	2
Caelo	Potassium citrate	12135303	2
Caelo	Potassium citrate	12135309	3
Phönix	Potassium citrate	12135310	4
Sanacorb	Potassium citrate	12135311	2
Caelo	Potassium citrate	12135311	1
Caelo	Potassium citrate	12299201	7
Großhandel	Potassium citrate	12299201	1
Caelo	Potassium citrate	12299202	2
Hiperscan	Potassium citrate		1
Fagron	Potassium citrate	1234	1
Fagron	Potassium citrate	1234567	1
Euro OTC	Potassium citrate	1306032-01	4
Phönix 21.05.2013	Potassium citrate	13080602	1
Gehe	Potassium citrate	1311036-01	1
Caelo	Potassium citrate	13080604	1
Caelo	Potassium citrate	13135903	3
Caelo	Potassium citrate	13135904	3
Caelo	Potassium citrate	1313598	1
Euro OTC	Potassium citrate	22101303	1
Caelo	Potassium citrate	28021402	1
Caelo	Potassium citrate	23121-01737	1
Caelo	Potassium citrate	3112M01737	1
Caelo	Potassium citrate	33131-01737	1
fragon	Potassium citrate		1
Caelo	Potassium citrate	3456	1
Caelo	Potassium citrate	5555	1
Fagron	Potassium citrate		1
ghfgh	Potassium citrate	3654645	1
Caelo	Potassium citrate	411025-1-P	1
Caelo	Potassium citrate	71730128	1
Caelo	Potassium citrate	71730367	1
Euro OTC	Potassium citrate	Ch1209005-01	1
Euro OTC	Potassium citrate	Ch1304022-01	2
HiperScan	Potassium citrate		1

- 76 854 spectra from 463 *Apo-Ident* customers from a total of 25 443 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Potassium citrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Potassium citrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	240	0	72 193
Type B	0	461	0	161 612
Type C	0	304	1	76 854

The substance/substance group *Potassium citrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.5000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 98.6985 %)
Type C	100.0000 % (> 99.8850 %)	99.6721 % (> 98.6885 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20655	21936	4.34	50.43
21452	22476	5.79	50.01
21775	21936	3.66	50.26
21936	21936	0.00	50.64
22476	22476	0.00	50.36
22921	22921	0.00	50.41

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Potassium hydrogen tartrate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20509-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Potassium hydrogen tartrate; Kalii bitartaricum; Kalii hydrogentartras

Special notes

When selecting the *Potassium hydrogen tartrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Potassium hydrogen tartrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Potassium hydrog…	11345805	20772	40	20120103
Caelo	Potassium hydrog…	15354609	23193	40	20151030
Caelo	Potassium hydrog…	170656	23285	40	20170511*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Potassium hydrogen tartrate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 310 spectra from 8 reference samples of the substance/substance group *Potassium hydrogen tartrate*.

- These include spectra of independent samples from 4 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Potassium hydrogen tartrate	11127421	20509	40
Caelo	Potassium hydrogen tartrate	11345805	20588	40
Caelo	Potassium hydrogen tartrate	11345805	20611	40
Caelo	Potassium hydrogen tartrate	11127402	20643	30
Caelo	Potassium hydrogen tartrate	11345805	20644	40
Caelo	Potassium hydrogen tartrate	11345805	20645	40
Caelo	Potassium hydrogen tartrate	17065604	23414	40
Caelo	Potassium hydrogen tartrate	17065603	23709	40

- 161 763 spectra from a total of 3494 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 25 spectra from 16 *Apo-Ident* customers from 19 batches from the substance/substance group *Potassium hydrogen tartrate*.

- These include spectra of independent samples from 17 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Potassium hydrogen tartrate	15081008	2
Caelo	Potassium hydrogen tartrate	13133120	2
Caelo	Potassium hydrogen tartrate	15081010	1
Caelo	Potassium hydrogen tartrate	14115208	1
Caelo	Potassium hydrogen tartrate	1534609	1
phönix	Potassium hydrogen tartrate	15354604	1
Sanacorp	Potassium hydrogen tartrate	15354609	1
Caelo	Potassium hydrogen tartrate	15354609	1
Caelo	Potassium hydrogen tartrate	23062015A	1
Caelo	Potassium hydrogen tartrate	160514b	1
Caelo	Potassium hydrogen tartrate	11345805	1
Caelo	Potassium hydrogen tartrate	11127417	1
Caelo	Potassium hydrogen tartrate	11345807	1
Gehe	Potassium hydrogen tartrate	11345808	1
Caelo	Potassium hydrogen tartrate	13030002	1
Caelo	Potassium hydrogen tartrate	13030006	3
Caelo	Potassium hydrogen tartrate	13133104	2
Caelo	Potassium hydrogen tartrate	13133114	1
Caelo	Potassium hydrogen tartrate	17061303	1
Caelo	Potassium hydrogen tartrate	90573259	1

- 77 134 spectra from 463 *Apo-Ident* customers from a total of 25 528 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Potassium hydrogen tartrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Potassium hydrogen tartrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	310	0	161 763
Type C	0	24	1	77 134

The substance/substance group *Potassium hydrogen tartrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 98.0645 %)
Type C	100.0000 % (> 99.8850 %)	96.0000 % (> 84.0000 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20772	23285	3.62	65.95
23193	23285	3.96	66.01
23285	23285	0.00	66.13

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Potassium sodium tartrate tetrahydrate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20782-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Potassium sodium tartrate tetrahydrate; Kalii natrii tartras tetrahydricus; Tartarus natronatus

Special notes

When selecting the *Potassium sodium tartrate tetrahydrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Potassium sodium tartrate tetrahydrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Potassium sodium…	12030207	20782	40	20120213
Caelo	Potassium sodium…	13216605	20998	40	1404530
Caelo	Potassium sodium…	14376001	21801	40	20150204

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Potassium sodium tartrate tetrahydrate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 112 spectra from 4 reference samples of the substance/substance group *Potassium sodium tartrate tetrahydrate*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Potassium sodium tartrate te…	14376001	21801†	20
Caelo	Potassium sodium tartrate te…	15375607	23207	40
Caelo	Potassium sodium tartrate te…	172577	23824	40
Caelo	Potassium sodium tartrate te…	15375601	not required	12

- 161 961 spectra from a total of 3495 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 0 spectra from 0 *Apo-Ident* customers from 0 batches from the substance/substance group *Potassium sodium tartrate tetrahydrate*.

- These include spectra of independent samples from 0 batches, of which no spectra have been used for the generation of the database.

- 77 159 spectra from 463 *Apo-Ident* customers from a total of 25 547 batches from a further 701 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Potassium sodium tartrate tetrahydrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Potassium sodium tartrate tetrahydrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	112	0	161 961
Type C	0	0	0	77 159

The substance/substance group *Potassium sodium tartrate tetrahydrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 94.6429 %)
Type C	100.0000 % (> 99.8849 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20782	20998	4.42	49.51
20998	20998	0.00	49.69
21801	20998	6.57	50.75

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Potassium sorbate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20020-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Potassium sorbate; Kalii sorbas; Kalii sorbinicum

Special notes

When selecting the *Potassium sorbate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Potassium sorbate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Potassium sorbate	13224604	21444	40	20130813
Euro OTC	Potassium sorbate	1508025	21892	40	20150902*
Euro OTC	Potassium sorbate	1608013	22786	40	20160819*
Caelo	Potassium sorbate	163266	23059	40	20170105*
Caelo	Potassium sorbate	17170008	23585	40	20170711

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 200 spectra of 5 reference samples from the substance/substance group *Potassium sorbate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 5 different batches.

- 72 233 spectra from a total of 1577 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 315 spectra from 8 reference samples of the substance/substance group *Potassium sorbate*.

- These include spectra of independent samples from 6 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Potassium sorbate	90877159	20020	75
Caelo	Potassium sorbate	11214207	20453	40
Caelo	Potassium sorbate	13224604	21444†	20
Euro OTC	Potassium sorbate	1508025	21892†	20
Euro OTC	Potassium sorbate	1703034	23176	40
Caelo	Potassium sorbate	171700	23638	40
Euro OTC	Potassium sorbate	1710015	23772	40
Caelo	Potassium sorbate	173451	23830	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 758 spectra from a total of 3491 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 489 spectra from 249 *Apo-Ident* customers from 108 batches from the substance/substance group *Potassium sorbate*.

- These include spectra of independent samples from 104 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Potassium sorbate	12211107	18
Caelo	Potassium sorbate	14380601	18
Caelo	Potassium sorbate	14380607	7
Caelo	Potassium sorbate	15248204	18
Caelo	Potassium sorbate	14380610	17
Caelo	Potassium sorbate	13065204	15
Caelo	Potassium sorbate	15248205	10
Caelo	Potassium sorbate	12059909	7
Caelo	Potassium sorbate	13224612	19
Caelo	Potassium sorbate	13224610	1
Caelo	Potassium sorbate	13065217	12
Fiebig	Potassium sorbate	10012210	1
Caelo	Potassium sorbate	10012210	1
Caelo	Potassium sorbate	11261304	4
Caelo	Potassium sorbate	12211101	13
Caelo	Potassium sorbate	10199505	1
Caelo	Potassium sorbate	1112331024	1
Caelo	Potassium sorbate	13065205	17
AHD	Potassium sorbate	13065216	1
Caelo	Potassium sorbate	2041402	1
Euro OTC	Potassium sorbate	1111038-02	3
Caelo	Potassium sorbate	9305601	2
Spinnrad	Potassium sorbate	1114331022	3
Spinnrad GmbH	Potassium sorbate	1114331022	1
spinnrad	Potassium sorbate	1114331022	1
Fagron	Potassium sorbate	1114331022	1
Caelo	Potassium sorbate	11192305	1
Caelo	Potassium sorbate	12211108	2
Caesar/ Noweda	Potassium sorbate	12211107	2
Fagron	Potassium sorbate	13065211	1
Caelo	Potassium sorbate	13065216	14
Caesar & Loretz GmbH Hi...	Potassium sorbate	13065217	2
Noweda	Potassium sorbate	13065222	1
Caelo	Potassium sorbate	13065222	2
Caelo	Potassium sorbate	13111409	1
Caelo	Potassium sorbate	1312024-01	2
Caelo	Potassium sorbate	13224604	16
Euro OTC	Potassium sorbate	1312024-01	2
Sonnenberg-Apotheke	Potassium sorbate	13224604	1
Ichthyol/Noweda	Potassium sorbate	13224604	1

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Supplier	Substance	Batch	Spectra
Caelo	Potassium sorbate	13224608	2
Caelo	Potassium sorbate	13224611	10
Apomix/Noweda	Potassium sorbate	13224611	1
Sanacorp	Potassium sorbate	13224611	1
Anzag 12.01.15	Potassium sorbate	13224611	1
Euro OTC	Potassium sorbate	13224612	1
Euro OTC	Potassium sorbate	1410020-01	1
sana	Potassium sorbate	13224612	1
Caelo	Potassium sorbate	13277804	1
Caelo	Potassium sorbate	14192605	2
Caelo	Potassium sorbate	1438060	1
Caelo	Potassium sorbate	14380602	2
Caelo	Potassium sorbate	14380606	7
Caelo	Potassium sorbate		1
Caesar&Loretz GmbH/Sana...	Potassium sorbate	14380607	1
Phoenix	Potassium sorbate	14380610	1
Sanacorp	Potassium sorbate	14380610	1
Caelo	Potassium sorbate	14380612	2
Caelo	Potassium sorbate	14380620	5
Caelo	Potassium sorbate	14380621	10
Caesar & Loretz/Noweda	Potassium sorbate	14380621	1
Fagron	Potassium sorbate	14380622	1
Caelo	Potassium sorbate	14380622	10
Caesar&Loretz GmbH	Potassium sorbate	14380622	1
Caelo	Potassium sorbate	14380627	7
Caesar & Loretz GmbH	Potassium sorbate	14380627	1
Caelo	Potassium sorbate	14380632	9
Phoenix	Potassium sorbate	14380627	1
phönix	Potassium sorbate	14380632	1
Caelo	Potassium sorbate	14380633	5
Caelo	Potassium sorbate	14380635	5
Euro OTC	Potassium sorbate	1508025-01	7
Caelo	Potassium sorbate	1438610	1
Caelo	Potassium sorbate	15248203	3
Caelo	Potassium sorbate	15382105	9
Caesar & Loretz GmbH Hi...	Potassium sorbate	15382105	1
Caelo	Potassium sorbate	15382103	1
Caelo	Potassium sorbate	15382114	7
Caelo	Potassium sorbate	15382106	1
Caelo	Potassium sorbate	15382115	3
Caelo	Potassium sorbate	16156505	1
Caelo	Potassium sorbate	16326606	5
Caelo	Potassium sorbate	16326602	1
Gehe	Potassium sorbate	16326606	1
Noweda	Potassium sorbate	16326606	1
Caelo	Potassium sorbate	16326607	7
cealo	Potassium sorbate	16326607	1
Caelo	Potassium sorbate	16326608	4
Caelo	Potassium sorbate	17170002	2
phönix	Potassium sorbate	16326608	1
Caelo	Potassium sorbate	16326609	1
Caelo	Potassium sorbate	17170007	2
Caelo	Potassium sorbate	17170008	2
Caelo	Potassium sorbate	17170012	1
Spinnrad GmbH	Potassium sorbate	214331021	1
gehe	Potassium sorbate	17170014	1
Euro OTC	Potassium sorbate	216331021	1
spinnrad	Potassium sorbate	216331021	1
spinnrad/gehe	Potassium sorbate	216331021	1
Phoenix	Potassium sorbate	216331021	1

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Supplier	Substance	Batch	Spectra
Spinnrad/Sanacorp	Potassium sorbate	315331021	2
Spinnrad/Gehe	Potassium sorbate	315331021	1
Fagron	Potassium sorbate	3115M-01748	1
Spinnrad	Potassium sorbate	315331021	2
Spinnrad	Potassium sorbate	616331022	1
Spinnrad/Sannacorp	Potassium sorbate	616331022	1
Fagron	Potassium sorbate	4314U-01748	1
Fagron	Potassium sorbate	3912A-01748	1
Spinnrad	Potassium sorbate	815331022	1
Phönix Gotha	Potassium sorbate		1
Spinnrad	Potassium sorbate	912331023	2
Caelo	Potassium sorbate	AKD12	1
Fagron	Potassium sorbate	912331023	2
Spinnrad GmbH	Potassium sorbate	111033102	1
	Potassium sorbate	10012203	1
Euro OTC	Potassium sorbate	1111038-01	1
Spinnrad	Potassium sorbate	111033102	1
Euro OTC	Potassium sorbate	111103802	1
spinnrad gmbh	Potassium sorbate	1111331023	1
Caelo	Potassium sorbate	11214207	1
Caesar & Loretz GmbH	Potassium sorbate	11261303	1
Gehe	Potassium sorbate	11261304	1
Caelo	Potassium sorbate	12059905	4
Caelo	Potassium sorbate	12059902	1
Caelo	Potassium sorbate	12059908	1
Phoenix, 11.09.2012	Potassium sorbate	12059909	1
Caelo	Potassium sorbate	12059914	3
Caelo	Potassium sorbate	1205999	1
Caelo	Potassium sorbate	1221101	1
Caelo	Potassium sorbate	1221107	1
Noweda	Potassium sorbate	12211101	1
Sanacorp	Potassium sorbate	12211101	1
Caelo	Potassium sorbate	12211102	5
Holderman 24.01.2013	Potassium sorbate	12211107	2
Noweda	Potassium sorbate	12211107	1
Kehr	Potassium sorbate	12211107	1
Caelo	Potassium sorbate	12211121	4
Caelo	Potassium sorbate	12345	1
Caelo	Potassium sorbate	12211123	1
Gehe 08.05.2013	Potassium sorbate	13065204	1
Caesar/Lorenz	Potassium sorbate	13065204	1
phonix	Potassium sorbate	13065205	1
Gehe	Potassium sorbate	13065205	1
Caelo	Potassium sorbate	13065211	1
Gehe	Potassium sorbate	13065216	2
canea, gehe	Potassium sorbate	13065215	1
Sanacorp	Potassium sorbate	13065217	1
Phoenix	Potassium sorbate	1397235	1
Spinnrad	Potassium sorbate	1901211748	1
Caelo	Potassium sorbate	20021112-2	1
Caelo	Potassium sorbate	200613K1	1
RFI Food Ingredients	Potassium sorbate	2006383927	1
Caelo	Potassium sorbate	2912M-01748	2
Spinnrad	Potassium sorbate	312331021	3
Caelo	Potassium sorbate	3512M-01748	1
Spinnrad GmbH	Potassium sorbate	912331023	2
siehe WE-Prüfprotokoll	Potassium sorbate	61/11	1
Caelo	Potassium sorbate	912331023	1
Caelo	Potassium sorbate	K-010213-1	1
Caelo	Potassium sorbate	AKD10	1

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Supplier	Substance	Batch	Spectra
Caelo	Potassium sorbate	91623299	2
s.Prüfprotokoll	Potassium sorbate		1

- 76 670 spectra from 463 *Apo-Ident* customers from a total of 25 445 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Potassium sorbate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Potassium sorbate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	200	0	72 233
Type B	0	308	7	161 758
Type C	0	469	20	76 670

The substance/substance group *Potassium sorbate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9928 %)	97.7778 % (> 96.8254 %)
Type C	100.0000 % (> 99.8849 %)	95.9100 % (> 95.2965 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21444	21892	15.30	40.01
21892	21892	0.00	40.70

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Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
22786	22786	0.00	42.54
23059	23059	0.00	35.99
23585	23059	9.82	37.46

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Potassium tartrate hemihydrate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20999-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Potassium tartrate hemihydrate; Kalii tartaricum; Kalii tartras hemihydricus

Special notes

When selecting the *Potassium tartrate hemihydrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Potassium tartrate hemihydrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Potassium tartra…	13331104	21440	40	20131002
Caelo	Potassium tartra…	15167701	21812	40	20150608
Caelo	Potassium tartra…	160289	22462	40	20160405*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Potassium tartrate hemihydrate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 140 spectra from 5 reference samples of the substance/substance group *Potassium tartrate hemihydrate*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Potassium tartrate hemihydrate	11225007	20623	40
Caelo	Potassium tartrate hemihydrate	13331101	20999	40
Caelo	Potassium tartrate hemihydrate	13331104	21440†	20
Caelo	Potassium tartrate hemihydrate	15167701	21812†	20
Caelo	Potassium tartrate hemihydrate	160289	22462†	20

- 161 933 spectra from a total of 3494 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B*

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 8 spectra from 3 *Apo-Ident* customers from 8 batches from the substance/substance group *Potassium tartrate hemihydrate*.

- These include spectra of independent samples from 8 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Potassium tartrate hemihydrate	12322105	1
Caelo	Potassium tartrate hemihydrate	13111415	1
Caelo	Potassium tartrate hemihydrate	13331109	1
Caelo	Potassium tartrate hemihydrate	11225007	1
Caelo	Potassium tartrate hemihydrate	12322110	1
Caelo	Potassium tartrate hemihydrate	15167703	1
Caelo	Potassium tartrate hemihydrate	13331113	1
Caelo	Potassium tartrate hemihydrate	27061304	1

- 77 151 spectra from 463 *Apo-Ident* customers from a total of 25 539 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Potassium tartrate hemihydrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Potassium tartrate hemihydrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	140	0	161 933
Type C	0	8	0	77 151

The substance/substance group *Potassium tartrate hemihydrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 95.7143 %)
Type C	100.0000 % (> 99.8851 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several

new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21440	22462	6.12	39.92
21812	22462	5.12	39.93
22462	22462	0.00	41.93

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Povidone 25, soluble**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20684-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Povidone 25, soluble; Povidonum 25, solubile

Special notes

When selecting the *Povidone 25, soluble* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Povidone 25, soluble*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Povidone 25, sol…	12032714	20684	40	1402437
Fagron	Povidone 25, sol…	12E22-N05	20770	40	1411537
Caelo	Povidone 25, sol…	14142103	21378	40	AR-15-FG-000596-01
Fagron	Povidone 25, sol…	13J21-N02	22731	40	AR-16-FG-019116-01
Caelo	Povidone 25, sol…	16307808	23255	40	AR-17-FG-015299-02
Fagron	Povidone 25, sol…	15C12-B02-323006	23265	40	1710348
Caelo	Povidone 25, sol…	180276	24044	40	20180202*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 280 spectra of 7 reference samples from the substance/substance group *Povidone 25, soluble*. These samples are listed above in the section *calibration samples*. The reference samples originate from 7 different batches.

- 72 153 spectra from a total of 1575 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 110 spectra from 3 reference samples of the substance/substance group *Povidone 25, soluble*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Povidone 25, soluble	12B07-N04	20559	40
Fagron	Povidone 25, soluble	12B07-N04	20635	40
Caelo	Povidone 25, soluble	172091	23619	30

- 161 963 spectra from a total of 3497 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 38 spectra from 13 *Apo-Ident* customers from 23 batches from the substance/substance group *Povidone 25, soluble*.

- These include spectra of independent samples from 21 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Povidone 25, soluble	14142109	3
Caelo	Povidone 25, soluble	14142103	1
Caelo	Povidone 25, soluble	12032714	1
Caelo	Povidone 25, soluble	14207508	3
Caelo	Povidone 25, soluble	14207511	4
Caelo	Povidone 25, soluble	14207515	1
Caelo	Povidone 25, soluble	15013716	1
Caelo	Povidone 25, soluble	15383101	3
Caelo	Povidone 25, soluble	15383102	1
Caelo	Povidone 25, soluble	15383103	3
Caelo	Povidone 25, soluble	16051101	1
Fagron	Povidone 25, soluble	15C12-B02-327866	1
Caelo	Povidone 25, soluble	16051108	1
Fagron	Povidone 25, soluble	15C12-B02	1
Caelo	Povidone 25, soluble	16051102	1
Caelo	Povidone 25, soluble	16051104	1
Caelo	Povidone 25, soluble	16307812	1
Caelo	Povidone 25, soluble	17209104	3
Fagron	Povidone 25, soluble	11276509T0	1
Caelo	Povidone 25, soluble	12376301	1
Fagron	Povidone 25, soluble	2470198800	1
Caelo	Povidone 25, soluble	13323407	2
Caelo	Povidone 25, soluble	16307809	2

- 77 121 spectra from 463 *Apo-Ident* customers from a total of 25 524 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Povidone 25, soluble* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Povidone 25, soluble* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	280	0	72 153
Type B	0	29	81	161 963
Type C	0	30	8	77 121

The substance/substance group *Povidone 25, soluble* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.8571 %)
Type B	100.0000 % (> 99.9928 %)	26.3636 % (> 23.6364 %)
Type C	100.0000 % (> 99.8850 %)	78.9474 % (> 71.0526 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20684	20684	0.00	18.61
20770	20770	0.00	19.84
21378	21378	0.00	17.54
22731	22731	0.00	22.41
23255	23255	0.00	14.00
23265	23265	0.00	16.14
24044	24044	0.00	18.00

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Povidone iodine**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20472-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Povidone iodine; Polyvinylpyrrolidoni jodum; Povidonum iodinatum

Special notes

When selecting the *Povidone iodine* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Povidone iodine*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Povidone iodine	13337205	21466	40	20131021
Euro OTC	Povidone iodine	1501029-01	21777	40	20150211
Euro OTC	Povidone iodine	1509009	21908	40	20150918*
Caelo	Povidone iodine	15234101	23252	40	AR-17-FG-015433-02
Euro OTC	Povidone iodine	1606026-02	23906	40	20160708

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 200 spectra of 5 reference samples from the substance/substance group *Povidone iodine*. These samples are listed above in the section *calibration samples*. The reference samples originate from 5 different batches.

- 72 233 spectra from a total of 1577 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 300 spectra from 9 reference samples of the substance/substance group *Povidone iodine*.

- These include spectra of independent samples from 6 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Povidone iodine	10090613	20202	40
Caelo	Povidone iodine	10090618	20472	40
Euro OTC	Povidone iodine	1110013-02	21073	40
Caelo	Povidone iodine	13337205	21466†	20
Euro OTC	Povidone iodine	1501029-01	21777†	20
Euro OTC	Povidone iodine	1509009	21908†	20
Euro OTC	Povidone iodine	1606026	22675	40
Caelo	Povidone iodine	15234109	23256	40
Euro OTC	Povidone iodine	1704007	23435	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 773 spectra from a total of 3490 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 59 spectra from 24 *Apo-Ident* customers from 32 batches from the substance/substance group *Povidone iodine*.

- These include spectra of independent samples from 29 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Euro OTC	Povidone iodine	1509009-02	1
Herbasinica	Povidone iodine	10090619	1
Phönix	Povidone iodine	1110013-02	1
Caelo	Povidone iodine	11168607	1
Stumpf	Povidone iodine	11168612	1
Caelo	Povidone iodine	11168612	1
Caelo	Povidone iodine	12153106	2
Caelo	Povidone iodine	12072605	1
Caelo	Povidone iodine	12153110	2
Caelo	Povidone iodine	12153116	2
Caelo	Povidone iodine	12153119	2
Fagron	Povidone iodine	1110013-02	1
Euro OTC	Povidone iodine	130901001	1
Euro OTC	Povidone iodine	1401029-01	1
Euro OTC	Povidone iodine	1407032-01	5
Caelo	Povidone iodine	14195810	3
Caelo	Povidone iodine	14195813	2
Caelo	Povidone iodine	1501029-01	3
Euro OTC	Povidone iodine	1501029-01	2
Euro OTC	Povidone iodine	1509009-01	1
Caelo	Povidone iodine	15121402	1
Caelo	Povidone iodine	15234101	1
Caelo	Povidone iodine	15442405	1
Euro OTC	Povidone iodine	1603023-01	2
Caelo	Povidone iodine	15234109	1
Euro OTC	Povidone iodine	1606026	1
Euro OTC	Povidone iodine	1606026-02	1
Euro OTC	Povidone iodine	1704007-01	2
Euroo/Phoenix	Povidone iodine	G3115BPZ0	1
Euro OTC	Povidone iodine	G4208BPZ0	2
Euro OTC	Povidone iodine	1110013-02	4
Euro OTC	Povidone iodine	110013-02	1
BASF, Noweda	Povidone iodine	1110013-02	2
Euro OTC	Povidone iodine	111001302	1
Caelo	Povidone iodine	19061302	1
Noweda	Povidone iodine	G0354BPZ0	1
Euro OTC	Povidone iodine	1005049-02	1
Caelo	Povidone iodine	1110013-02	1

- 77 100 spectra from 463 *Apo-Ident* customers from a total of 25 516 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Povidone iodine* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Povidone iodine* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	200	0	72 233
Type B	0	278	22	161 773
Type C	0	52	7	77 100

The substance/substance group *Povidone iodine* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9928 %)	92.6667 % (> 91.6667 %)
Type C	100.0000 % (> 99.8850 %)	88.1356 % (> 83.0508 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21466	21908	5.96	22.19
21777	21908	5.60	18.82
21908	21908	0.00	20.88
23252	23252	0.00	18.51
23906	21908	8.12	20.62

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Prasterone**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20703-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Prasterone; Prasteronum

Special notes

When selecting the *Prasterone* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Prasterone*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Prasterone	1102036-01	20703	40	1404310
Fagron	Prasterone	13J10-B02-287175	20960	40	1404309
Euro OTC	Prasterone	1506011	21824	40	20150629*
Fagron	Prasterone	15G14-B07-310827	21917	40	20150814
Euro OTC	Prasterone	1602018	22506	30	20160301*

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Prasterone	1704012	23389	40	20170529*
Euro OTC	Prasterone	1707014	23695	40	20170829*
Fagron	Prasterone	16L13-B01-330724	23865	40	20161228
Euro OTC	Prasterone	1710035	23868	40	20171212*
Euro OTC	Prasterone	1712014	23893	40	20180115*
Audor	Prasterone	APZDHA16003-M	23931	40	1805404

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 430 spectra of 11 reference samples from the substance/substance group *Prasterone*. These samples are listed above in the section *calibration samples*. The reference samples originate from 11 different batches.

- 72 003 spectra from a total of 1571 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 440 spectra from 11 reference samples of the substance/substance group *Prasterone*.

- These include spectra of independent samples from 4 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Prasterone	10L22-N12	20445	40
Fagron	Prasterone	10L22-N12	20527	40
Euro OTC	Prasterone	1506011	21824†	20

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*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Prasterone	15G14-B07-310827	21917†	20
Euro OTC	Prasterone	1702025	23147	40
Audor Pharma	Prasterone	APZDHA16003-1MD	23932	40
Fagron	Prasterone	18C12-B01-347633	23990	40
Euro OTC	Prasterone	1506011	21824SI	60
Fagron	Prasterone	15G14-B07-310827	21917SI	60
Euro OTC	Prasterone	1602018	22506SI	40
Euro OTC	Prasterone	1702025	23147SI	40

- 161 633 spectra from a total of 3492 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 78 spectra from 27 *Apo-Ident* customers from 50 batches from the substance/substance group *Prasterone*.

- These include spectra of independent samples from 48 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Prasterone	14H12-B05-297727	2
Fagron	Prasterone	15G14-B07-310827	1
Audor Pharma	Prasterone	10050051/1P	1
Euro OTC	Prasterone	1102036-01	1
Euro OTC	Prasterone	1409004-01	4
Audor Pharma	Prasterone	AP11040002P	3
Euro OTC	Prasterone	1412028-01	2
Euro OTC	Prasterone	2081302	1
Nachprüfung	Prasterone	120022	1
Euro OTC	Prasterone	4091511	1
Euro OTC	Prasterone	1203010-01	2
Fagron	Prasterone	12C26-N09	1
Fagron	Prasterone	12G04-N19	2
Fragon	Prasterone	12G04-N19	1
Fagron	Prasterone	12K30-N06	3
Euro OTC	Prasterone	1306021-01	4
Euro OTC	Prasterone	1311002-01	3
EuRho	Prasterone	1311002-01	1
Fagron	Prasterone	13J10-B02	1
Euro OTC	Prasterone	1401040-01	3
Euro OTC	Prasterone	140900401	1
Euro OTC	Prasterone	1412028	1
Caelo	Prasterone	1412028-01	1

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†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Supplier	Substance	Batch	Spectra
Fagron	Prasterone	14C18-B02	1
Fagron	Prasterone	14c18b02293602	1
Fagron	Prasterone	14C18-B02-293606	1
Fagron	Prasterone	14C18-Bo2-293603	1
Fagron	Prasterone	14h12b05-297723	1
Fagron	Prasterone	14J21-B03-303458	1
Euro OTC	Prasterone	1506011-01	2
Fagron	Prasterone	15A15-B40-307323	1
Fagron	Prasterone	15I18-B09-316798	1
Euro OTC	Prasterone	1602018-01	1
Fagron	Prasterone	16B19-B04	1
Euro OTC	Prasterone	1602018-02	1
Fagron	Prasterone	16B19-B04-318665	1
Caelo	Prasterone	16B19-B04-318665	1
Fargon	Prasterone	16B19-B04-318665	1
Caelo	Prasterone	16I02-B02-326485	1
Fagron	Prasterone	16J26-B03-327602	1
Fagron	Prasterone	16l02-B02-326485	2
Fagron	Prasterone	19061304	1
Haihang	Prasterone	20130507	1
Haihang Industry	Prasterone	20130816	4
Euro OTC	Prasterone	22021306	1
Euro OTC	Prasterone	26031506	1
Euro OTC	Prasterone	30041509	1
Fagron	Prasterone	7013260004	1
Euro OTC	Prasterone	9215-4/09	1
Fagron	Prasterone	L14050137	1
Caelo	Prasterone	T03-04	1
NWM Shandong Northwest ...	Prasterone	PST151207	1
Euro OTC	Prasterone	T03-04/1412028-01	1
Fagron	Prasterone	13J10-B02-287177	1
Euro OTC	Prasterone	XPC0263	1

- 77 081 spectra from 463 *Apo-Ident* customers from a total of 25 497 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Prasterone* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Prasterone* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	430	0	72 003
Type B	0	421	19	161 633
Type C	0	77	1	77 081

The substance/substance group *Prasterone* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

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	Specificity	Recognition rate
Type A	100.0000 % (> 99.9887 %)	100.0000 % (> 98.6047 %)
Type B	100.0000 % (> 99.9928 %)	95.6818 % (> 95.0000 %)
Type C	100.0000 % (> 99.8850 %)	98.7179 % (> 94.8718 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20703	20703	0.00	53.05
20960	20960	0.00	54.46
21824	21824	0.00	54.13
21917	21824	15.88	52.58
22506	22506	0.00	46.22
23389	23389	0.00	24.55
23695	23695	0.00	33.99
23865	23893	14.87	42.99
23868	23868	0.00	27.46
23893	23893	0.00	29.75
23931	23931	0.00	37.99

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Prednicarbate, micronized**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20196-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Prednicarbate, micronized; Prednicarbatum micronisatum

Special notes

When selecting the *Prednicarbate, micronized* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Prednicarbate, micronized*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Prednicarbate, m…	12D27-N04	20700	40	20120509
Caelo	Prednicarbate, m…	13119402	20832	35	1501576
Caelo	Prednicarbate, m…	13119402	20833	40	20130517
Caelo	Prednicarbate, m…	13372404	21368	40	AR-15-FG-007941-02
Caelo	Prednicarbate, m…	13372404	21369	40	20131119

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Prednicarbate, m...	14A27-B02-291256	21572	40	AR-16-FG-011442-01
Euro OTC	Prednicarbate, m...	1302033-02	21610	40	1509286
Euro OTC	Prednicarbate, m...	1507011	21858	35	20150730*
Euro OTC	Prednicarbate, m...	1601058	22366	30	20160223*
Fagron	Prednicarbate, m...	12D27-N04	20700SI	33	20120509
Caelo	Prednicarbate, m...	13119402	20833SI	20	20130517
Caelo	Prednicarbate, m...	13372404	21369SI	23	20131119
Euro OTC	Prednicarbate, m...	1601058	22366SI	21	20160223*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 437 spectra of 13 reference samples from the substance/substance group *Prednicarbate, micronized*. These samples are listed above in the section *calibration samples*. The reference samples originate from 7 different batches.

- 71 996 spectra from a total of 1575 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 789 spectra from 29 reference samples of the substance/substance group *Prednicarbate, micronized*.

- These include spectra of independent samples from 10 batches, of which no spectra have been used for the generation of the database.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Prednicarbate, micronized	10J04-N10	20196	40
Fagron	Prednicarbate, micronized	14A27-B02-291256	21572†	20
Euro OTC	Prednicarbate, micronized	1302033-02	21610†	20
Euro OTC	Prednicarbate, micronized	1507011	21858†	19
Euro OTC	Prednicarbate, micronized	1601058	22366†	15
Caelo	Prednicarbate, micronized	160874	22447	60
Euro OTC	Prednicarbate, micronized	1605001	22558	30
Euro OTC	Prednicarbate, micronized	1607012	22703	40
Euro OTC	Prednicarbate, micronized	1609022	22860	40
Caelo	Prednicarbate, micronized	170138	23040	40
Euro OTC	Prednicarbate, micronized	1707022	23540	40
Caelo	Prednicarbate, micronized	173156	23845	40
Caelo	Prednicarbate, micronized	172204	23848	40
Euro OTC	Prednicarbate, micronized	1801013	23887	40
Fagron	Prednicarbate, micronized	12D27-N04	20700SI†	15
Caelo	Prednicarbate, micronized	13119402	20833SI†	10
Caelo	Prednicarbate, micronized	13372404	21369SI†	10
Fagron	Prednicarbate, micronized	14A27-B02-291256	21572SI	36
Euro OTC	Prednicarbate, micronized	1507011	21858SI	15
Euro OTC	Prednicarbate, micronized	1601058	22366SI†	10
Caelo	Prednicarbate, micronized	160874	22447SI	30
Euro OTC	Prednicarbate, micronized	1605001	22558SI	25
Euro OTC	Prednicarbate, micronized	1607012	22703SI	28
Euro OTC	Prednicarbate, micronized	1609022	22860SI	27
Caelo	Prednicarbate, micronized	170138	23040SI	20
Euro OTC	Prednicarbate, micronized	1707022	23540SI	19
Caelo	Prednicarbate, micronized	173156	23845SI	20
Caelo	Prednicarbate, micronized	172204	23848SI	20
Euro OTC	Prednicarbate, micronized	1801013	23887SI	20

- 161 284 spectra from a total of 3482 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 441 spectra from 172 *Apo-Ident* customers from 147 batches from the substance/substance group *Prednicarbate, micronized*.

- These include spectra of independent samples from 143 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Prednicarbate, micronized	8081403	1
Caelo	Prednicarbate, micronized	9764897	1
Fagron	Prednicarbate, micronized	10J04-N10	1

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†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Supplier	Substance	Batch	Spectra
Fagron	Prednicarbate, micronized	11D29-N06	1
Caelo	Prednicarbate, micronized	12383304	3
Caelo	Prednicarbate, micronized	12383305	1
Fagron	Prednicarbate, micronized	11L23-N07	6
Fagron	Prednicarbate, micronized	13/23-N04	3
Caelo	Prednicarbate, micronized	13/23-N04	1
Caelo	Prednicarbate, micronized	13224401	7
Caelo	Prednicarbate, micronized	13119401	1
Caelo	Prednicarbate, micronized	13119402	2
Sino Phyto	Prednicarbate, micronized	13224401	1
Caelo	Prednicarbate, micronized	13224406	1
Caelo	Prednicarbate, micronized	13372403	11
Fagron	Prednicarbate, micronized	13372408	1
Caelo	Prednicarbate, micronized	13372410	6
Caelo	Prednicarbate, micronized	13372408	1
Apomix/Noweda	Prednicarbate, micronized	13372410	2
Caelo	Prednicarbate, micronized	13372411	2
Caelo	Prednicarbate, micronized	13372419	5
Fagron	Prednicarbate, micronized	13C25-N06	8
Fagron	Prednicarbate, micronized	13g05-n03	1
Fagron	Prednicarbate, micronized	13I23-N04	8
Fagron	Prednicarbate, micronized	14A27-B02	1
Fagron	Prednicarbate, micronized	14A27-B02-291256	18
Fagron	Prednicarbate, micronized	14a27-b02-291256	2
Fagron	Prednicarbate, micronized	14A27B02291256	1
Fagron	Prednicarbate, micronized	14A27-B02-291258	2
Fagron	Prednicarbate, micronized	14A27-B02-295793	1
Fagron	Prednicarbate, micronized	14A27-B02-295796	8
Caelo	Prednicarbate, micronized	14A27-B02-295796	1
Fagron	Prednicarbate, micronized	14A27-B02-295797	5
Caelo	Prednicarbate, micronized	14J16-B06	1
Fagron	Prednicarbate, micronized	14B13-B31-291255	1
Fagron	Prednicarbate, micronized	14J16-B06303465	1
Fagron	Prednicarbate, micronized	14J16B06	1
Fagron	Prednicarbate, micronized	14J16-B06-303465	16
Euro OTC	Prednicarbate, micronized	1501033-01	1
Fagron	Prednicarbate, micronized	14J16B06303466	1
Fagron	Prednicarbate, micronized	14J16-Bo6303465	1
Euro OTC	Prednicarbate, micronized	1501033-02	4
Caelo	Prednicarbate, micronized	1507011-01	1
Euro OTC	Prednicarbate, micronized	1507011-01	2
Euro OTC	Prednicarbate, micronized	1507011-02	4
Caelo	Prednicarbate, micronized	1517E-03595	1
Caelo	Prednicarbate, micronized	15181403	15
Hedinger/ Sanacorp	Prednicarbate, micronized	15181403	1
Caelo	Prednicarbate, micronized	15181404	3
Apotärze	Prednicarbate, micronized	15181409	1
Caelo	Prednicarbate, micronized	15181409	4
Caelo	Prednicarbate, micronized	15181411	3
caesar&loretz,Phönix	Prednicarbate, micronized	15181411	1
Caelo	Prednicarbate, micronized	15446301	18
Noweda	Prednicarbate, micronized	15446301	1
Caelo	Prednicarbate, micronized	15446302	10
Caelo	Prednicarbate, micronized	15446303	3
Caelo	Prednicarbate, micronized	15446305	6
Caelo	Prednicarbate, micronized	15446304	1
Caelo	Prednicarbate, micronized	15446306	7
E und J, 22.07.2016	Prednicarbate, micronized	15446306	2
Caelo	Prednicarbate, micronized	15D15-B03	1
Fagron	Prednicarbate, micronized	15D15-B03-308161	4

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Supplier	Substance	Batch	Spectra
Caelo	Prednicarbate, micronized	15D15-B03-308161	2
Fagro/Gehe	Prednicarbate, micronized	15D15-B03-308161	1
Fagron	Prednicarbate, micronized	15D15-B03-308162	2
Fagron	Prednicarbate, micronized	15D15-B03-309682	1
Caelo	Prednicarbate, micronized	15D15-B03-310847	2
Fagron	Prednicarbate, micronized	15G10-B02	1
Fagron	Prednicarbate, micronized	15G10-B02-31084	1
Fagron	Prednicarbate, micronized	15G10-B02-310848	3
Fagron	Prednicarbate, micronized	15G10-B02-311819	1
Fagron	Prednicarbate, micronized	15G10-B02-314082	4
Fagron	Prednicarbate, micronized	15J22-B04	1
Fagron	Prednicarbate, micronized	15J22-B04-316799	3
Fagron	Prednicarbate, micronized	15J22-B04-318528	3
Phönix	Prednicarbate, micronized	15J22-B04-318528	1
Fagron	Prednicarbate, micronized	15J22-B04-318930	2
Fargon	Prednicarbate, micronized	15J22-B04-318930	1
Caelo	Prednicarbate, micronized	15J22-B-321005	1
Fagron	Prednicarbate, micronized	15J22-B04-321005	1
Fagron	Prednicarbate, micronized	15J-B04-316799	1
Fagron	Prednicarbate, micronized	16/27-B01-332958	1
Euro OTC	Prednicarbate, micronized	1601058-01	6
Caelo	Prednicarbate, micronized	1601058-01	1
Euro OTC	Prednicarbate, micronized	1605001	1
Euro OTC	Prednicarbate, micronized	1605001-01	7
Sonnenberg-Apotheke	Prednicarbate, micronized	1607012-01	1
Caelo	Prednicarbate, micronized	1607012-01	2
Euro OTC	Prednicarbate, micronized	1607012-01	4
Caelo	Prednicarbate, micronized	16087401	6
Caelo	Prednicarbate, micronized	1608710	1
Caelo	Prednicarbate, micronized	16087408	9
caesar&loretz GmbH,AHC,...	Prednicarbate, micronized	16087408	1
Caelo	Prednicarbate, micronized	16087410	4
Caesar & Loretz GmbH	Prednicarbate, micronized	16087410	1
Caelo	Prednicarbate, micronized	16087411	3
Caelo	Prednicarbate, micronized	16087412	2
Caelo	Prednicarbate, micronized	1609022-01	3
Euro OTC	Prednicarbate, micronized	1609022-01	9
Noweda/Apomix	Prednicarbate, micronized	1609022-01	2
Fagron	Prednicarbate, micronized	160902201	1
Caelo	Prednicarbate, micronized	16A18-B01-322732	1
Celo	Prednicarbate, micronized	1687408	1
Caelo	Prednicarbate, micronized	16987410	1
Sanacorp, 01.03.17, 21,...	Prednicarbate, micronized	1687410	1
Fagron	Prednicarbate, micronized	1612-B01-325758	1
Fagron	Prednicarbate, micronized	16A18-B01-322732	1
Caelo	Prednicarbate, micronized	16A18-B01-322733	2
Fagron	Prednicarbate, micronized	16E12-B01	2
Fagron	Prednicarbate, micronized	16E12-B01-325758	4
Fagron	Prednicarbate, micronized	16E12-B01-327344	3
Caelo	Prednicarbate, micronized	16E12-B01-325758	1
Phönix	Prednicarbate, micronized	16J27-B01-330976	1
Fagron	Prednicarbate, micronized	16E12-B01-328270	1
Fagron	Prednicarbate, micronized	16J27-B01-330976	1
Fagron	Prednicarbate, micronized	16J27-b01-330976	1
Fagron	Prednicarbate, micronized	16j27-b01-330976	1
Caelo	Prednicarbate, micronized	17013804	3
Fagron	Prednicarbate, micronized	16J27-B01-330977	1
Phoenix	Prednicarbate, micronized	16J27-b01-332958	1
Fagron	Prednicarbate, micronized	17013804	1
Caelo	Prednicarbate, micronized	17013805	2

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Supplier	Substance	Batch	Spectra
Caelo	Prednicarbate, micronized	17014001	1
Caelo	Prednicarbate, micronized	17014003	3
Caelo	Prednicarbate, micronized	17014005	2
Euro OTC	Prednicarbate, micronized	1707022-01	1
Caelo	Prednicarbate, micronized	17220407	3
Caelo	Prednicarbate, micronized	17220408	1
Bombastus	Prednicarbate, micronized	17220408	1
Fagron	Prednicarbate, micronized	17C27-B01-335530	1
Fagron	Prednicarbate, micronized	17C27-B01-335531	2
Fagron	Prednicarbate, micronized	17J04-B05-340570	1
Caelo	Prednicarbate, micronized	4/AKD7	1
Fagron	Prednicarbate, micronized	701867-0001	1
Fagron	Prednicarbate, micronized	NT0555M13I23-N04	1
Fagron	Prednicarbate, micronized	NT0780M	2
Fagron	Prednicarbate, micronized	NU0823M	1
Fagron	Prednicarbate, micronized	NU0823M	1
Fragron	Prednicarbate, micronized	NV0485M	1
Fagron	Prednicarbate, micronized	7061303	1
Fagron	Prednicarbate, micronized	8L10-N12	1
Fagron	Prednicarbate, micronized	9E04-N02	1
Fagron	Prednicarbate, micronized	9G14-N06	1
Fagron	Prednicarbate, micronized	11/22-N18	1
Caelo	Prednicarbate, micronized	11L23-N07	1
Sanacorp	Prednicarbate, micronized	11L23-N07	1
Fagron	Prednicarbate, micronized	11L23N07	1
Caelo	Prednicarbate, micronized	12123607	2
Caelo	Prednicarbate, micronized	12123610	1
Caelo	Prednicarbate, micronized	12383309	1
Caelo	Prednicarbate, micronized	12383301	1
Gehe	Prednicarbate, micronized	12B14-N02	1
Fagron	Prednicarbate, micronized	12B14-N02	2
Fagron	Prednicarbate, micronized	12B20-N06	2
Fagron	Prednicarbate, micronized	12D27-N01	2
Fagron	Prednicarbate, micronized	12D27-N04	4
Defektur	Prednicarbate, micronized	12D27-N04	1
Fagron	Prednicarbate, micronized	12H20-No7	1
Euro OTC	Prednicarbate, micronized	1302033-01	1
Euro OTC	Prednicarbate, micronized	1302033-02	2
Fagron	Prednicarbate, micronized	13C25-N02	1
Fagron	Prednicarbate, micronized	13c25-no6	1
Fagron	Prednicarbate, micronized	13F11-N01	7
Fagron	Prednicarbate, micronized	13F11-NO1	1
Caelo	Prednicarbate, micronized	13F11-N02	1
Fagron	Prednicarbate, micronized	13F11-No1	2
Gehe	Prednicarbate, micronized	13G05-n03	1
Amos Vital	Prednicarbate, micronized	13G05-N03	1
Fagron	Prednicarbate, micronized	13G05-N03	5
Gehe	Prednicarbate, micronized	13123-N04	1
Fagron	Prednicarbate, micronized	13123-N04	1
Caelo	Prednicarbate, micronized	23082013A	1
Fagron	Prednicarbate, micronized	15D15-B03308161	1
Fagron	Prednicarbate, micronized	3010E-03595	1
Caelo	Prednicarbate, micronized	C0333/1111070	1
Fagron	Prednicarbate, micronized	NTo555M	1
Caelo	Prednicarbate, micronized	1213608	1
Fagron	Prednicarbate, micronized	12b20-n06	1
Fagron	Prednicarbate, micronized	13c25-n06	1

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- 76 718 spectra from 463 *Apo-Ident* customers from a total of 25 400 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Prednicarbate, micronized* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Prednicarbate, micronized* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	437	0	71 996
Type B	0	789	0	161 284
Type C	0	441	0	76 718

The substance/substance group *Prednicarbate, micronized* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9887 %)	100.0000 % (> 98.6270 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 99.2395 %)
Type C	100.0000 % (> 99.8849 %)	100.0000 % (> 98.6395 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20700	21572	8.08	36.90
20832	20832	0.00	31.95
20833	20832	2.22	32.03
21368	21368	0.00	31.00
21369	21368	1.90	31.11
21572	21572	0.00	33.36
21610	21610	0.00	26.70
21858	21858	0.00	27.74
22366	22366	0.00	31.13

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Prednisolon dihydrogen phosphate dinatrium**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20212-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Prednisolon dihydrogen phosphate dinatrium; Prednisoloni natrii phosphas; Prednisolonum natrii phosphoricum

Special notes

When selecting the *Prednisolon dihydrogen phosphate dinatrium* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Prednisolon dihydrogen phosphate dinatrium*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Prednisolon dihy…	13304703	20923	40	20130904
Caelo	Prednisolon dihy…	13304704	21412	40	1411052
Fagron	Prednisolon dihy…	14E07-B06-295251	21571	40	20140623

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Prednisolon dihydrogen phosphate dinatrium*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 220 spectra from 6 reference samples of the substance/substance group *Prednisolon dihydrogen phosphate dinatrium*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Prednisolon dihydrogen phosp…	11C18-N11	20212	40
Caelo	Prednisolon dihydrogen phosp…	13304704	21412†	20
Caelo	Prednisolon dihydrogen phosp…	13304704	21413	60
Fagron	Prednisolon dihydrogen phosp…	14E07-B06-295251	21571†	20
Fagron	Prednisolon dihydrogen phosp…	16I14-B03-328918	23270	40
Caelo	Prednisolon dihydrogen phosp…	16174715	23271	40

- 161 853 spectra from a total of 3494 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 65 spectra from 26 *Apo-Ident* customers from 34 batches from the substance/substance group *Prednisolon dihydrogen phosphate dinatrium*.

- These include spectra of independent samples from 33 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Prednisolon dihydrogen phosp…	13/27-N01	1
Fagron	Prednisolon dihydrogen phosp…	13I27-N01	3
Caelo	Prednisolon dihydrogen phosp…	14196602	1
Fagron	Prednisolon dihydrogen phosp…	14E07-B06-295253	1
Fagron	Prednisolon dihydrogen phosp…	14E07-B06-295251	3
Fagron	Prednisolon dihydrogen phosp…	14G30-B09	1
Fagron	Prednisolon dihydrogen phosp…	14G30-B09-303012	7
Fagron	Prednisolon dihydrogen phosp…	14G30-B09-303014	4
Caelo	Prednisolon dihydrogen phosp…	15199602	2
Caelo	Prednisolon dihydrogen phosp…	15199603	1
Caesar & Loretz GmbH Hi…	Prednisolon dihydrogen phosp…	15C19-B05-30885	1
Fagron	Prednisolon dihydrogen phosp…	15f29-b11-309694	1
Fagron	Prednisolon dihydrogen phosp…	15F29-B11-309694	1
Fagron	Prednisolon dihydrogen phosp…	15J01-B02	4
Fagron	Prednisolon dihydrogen phosp…	15J01-B02-312722	3
Fagron	Prednisolon dihydrogen phosp…	15J01-B02-313610	2
Newchem spa	Prednisolon dihydrogen phosp…	15J01-B02-313610	2
Fagron	Prednisolon dihydrogen phosp…	15J01-B02-317180	2
Fagron	Prednisolon dihydrogen phosp…	15K27-B09	1
Alte Apotheke	Prednisolon dihydrogen phosp…	15K27B09-318738	1
Fagron	Prednisolon dihydrogen phosp…	15K27-B09-322162	1
Fagron	Prednisolon dihydrogen phosp…	15K27-B09-326263	3
Fagron	Prednisolon dihydrogen phosp…	15K27B09-326263	1
Caelo	Prednisolon dihydrogen phosp…	16174701	1
Caelo	Prednisolon dihydrogen phosp…	16174702	1
Fagron	Prednisolon dihydrogen phosp…	16I14-B03-328169	2
Fagron	Prednisolon dihydrogen phosp…	16I14-B03-328918	2
Caelo	Prednisolon dihydrogen phosp…	17077502	1
Fagron	Prednisolon dihydrogen phosp…	NU1356	1
Fagron	Prednisolon dihydrogen phosp…	11C18-N11	1
Fagron	Prednisolon dihydrogen phosp…	11K11-N11	2
Fagron	Prednisolon dihydrogen phosp…	12H30-N08	2
Fagron	Prednisolon dihydrogen phosp…	13A10-N04	3
Fagron	Prednisolon dihydrogen phosp…	13H19N04	1
Fagron	Prednisolon dihydrogen phosp…	13C26N06	1

- 77 094 spectra from 463 *Apo-Ident* customers from a total of 25 513 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model,

the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Prednisolon dihydrogen phosphate dinatrium* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Prednisolon dihydrogen phosphate dinatrium* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	117	3	72 313
Type B	0	220	0	161 853
Type C	0	64	1	77 094

The substance/substance group *Prednisolon dihydrogen phosphate dinatrium* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	97.5000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 97.2727 %)
Type C	100.0000 % (> 99.8850 %)	98.4615 % (> 93.8462 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20923	21412	15.31	44.86
21412	21412	0.00	40.43
21571	21412	11.09	49.16

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Prednisolone acetate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20089-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Prednisolone acetate; Prednisolinum aceticum; Prednisoloni acetas

Special notes

When selecting the *Prednisolone acetate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Prednisolone acetate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Prednisolone ace…	12091814	20784	60	20120416
Fagron	Prednisolone ace…	12H14-N07	20795	40	20120829
Caelo	Prednisolone ace…	12324502	20877	20	20121112
Euro OTC	Prednisolone ace…	1306040	21096	40	20130812
Caelo	Prednisolone ace…	13262605	21450	40	20130923

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Prednisolone ace...	1209028-03	21530	40	AR-15-FG-010480-01
Euro OTC	Prednisolone ace...	1512020	22297	30	20160119*
Fagron	Prednisolone ace...	12H14-N07	20795SI	34	20120829
Caelo	Prednisolone ace...	13262605	21450SI	36	20130923
Euro OTC	Prednisolone ace...	1512020	22297SI	29	20160119*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 369 spectra of 10 reference samples from the substance/substance group *Prednisolone acetate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 7 different batches.

- 72 064 spectra from a total of 1575 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 344 spectra from 12 reference samples of the substance/substance group *Prednisolone acetate*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Prednisolone acetate	13262605	21448	60
Caelo	Prednisolone acetate	13262605	21450†	20
Euro OTC	Prednisolone acetate	1209028-03	21530†	20
Euro OTC	Prednisolone acetate	1512020	22297†	15

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*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Prednisolone acetate	1607010	22710	40
Euro OTC	Prednisolone acetate	1701041	23142	40
Fagron	Prednisolone acetate	12H14-N07	20795SI†	15
Caelo	Prednisolone acetate	13262605	21448SI	44
Caelo	Prednisolone acetate	13262605	21450SI†	11
Euro OTC	Prednisolone acetate	1512020	22297SI†	15
Euro OTC	Prednisolone acetate	1607010	22710SI	40
Euro OTC	Prednisolone acetate	1701041	23142SI	24

- 161 729 spectra from a total of 3493 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 980 spectra from 292 *Apo-Ident* customers from 191 batches from the substance/substance group *Prednisolone acetate*.

- These include spectra of independent samples from 184 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Prednisolone acetate	12324504	11
Fagron	Prednisolone acetate	12L11-B40-286915	3
Gutenberg-Apotheke	Prednisolone acetate	12L11-B40-286915	2
Caelo	Prednisolone acetate	13262601	23
VDL;7,15EUR, 21:06:14	Prednisolone acetate	13262602	1
Caelo	Prednisolone acetate	13262609	5
Fagron	Prednisolone acetate	13K20-B04-293970	2
Caelo	Prednisolone acetate	140601401	1
Caelo	Prednisolone acetate	14175514	7
Fiebig	Prednisolone acetate	11158001	1
Euro OTC	Prednisolone acetate	1209028-02	16
holdermann euro	Prednisolone acetate	1209028-02	3
Caelo	Prednisolone acetate	12091806	4
Caelo	Prednisolone acetate	12091810	2
Caelo	Prednisolone acetate	12091813	1
Caelo	Prednisolone acetate	12324509	3
Fagron	Prednisolone acetate	12L05-N01	12
Euro OTC	Prednisolone acetate	1306040-01	26
EUro/AHD	Prednisolone acetate	1306040-01	1
EUro/AHD	Prednisolone acetate	1306040-02	1
Fagron	Prednisolone acetate	13A07-N07	7
Fagron	Prednisolone acetate	13D03-N06	1
Phönix	Prednisolone acetate	13262605	1

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†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Supplier	Substance	Batch	Spectra
Caelo	Prednisolone acetate	313I-02106	1
Euro OTC	Prednisolone acetate	3707556	1
Caelo	Prednisolone acetate	5031511	1
Euro OTC	Prednisolone acetate	1108043-02	16
Fagron	Prednisolone acetate	115B03-B05-308582	1
Euro OTC	Prednisolone acetate	1203028-03	1
Euro OTC	Prednisolone acetate	1209028-03	2
Caelo	Prednisolone acetate	12091804	8
Caelo	Prednisolone acetate	12324503	1
Caelo	Prednisolone acetate	12324506	13
Caelo	Prednisolone acetate	12324514	2
Caelo	Prednisolone acetate	12324508	11
Fagron	Prednisolone acetate	12G25-N05	5
Fagron	Prednisolone acetate	12k20-b04293971	1
Fagron	Prednisolone acetate	12L11-B40	2
Fagron	Prednisolone acetate	12L11-B40-286905	14
Phoenix	Prednisolone acetate	12L11-B40-286905	1
Noweda	Prednisolone acetate	12L11-B40-286905	1
Symbiotica Spec./Phönix	Prednisolone acetate	1306040-02	1
Euro OTC	Prednisolone acetate	1306040-02	18
Caelo	Prednisolone acetate	1306040-02	1
EuRho	Prednisolone acetate	1306040-03	1
Euro OTC	Prednisolone acetate	1306040-03	1
Euro OTC	Prednisolone acetate	1306040101	1
Euro OTC	Prednisolone acetate	1306040-1	1
AHD 23.10.14 EK17,24	Prednisolone acetate	13262601	1
Caelo	Prednisolone acetate	13262602	9
Caelo	Prednisolone acetate	13262603	10
Caelo	Prednisolone acetate	13262605	15
Fagron	Prednisolone acetate	13262605	1
GEHE 03.07.2014	Prednisolone acetate	13262605	1
Caelo	Prednisolone acetate	13262606	7
Euro OTC	Prednisolone acetate	13262606	1
Caelo	Prednisolone acetate	13343112	1
Fagron	Prednisolone acetate	13K20-B04-289494	3
Fagron	Prednisolone acetate	13K20-B04	2
Fagron	Prednisolone acetate	13K20-B04-289495	2
Fagron	Prednisolone acetate	13K20-B04-293971	3
Euro OTC	Prednisolone acetate	140601-02	1
Euro OTC	Prednisolone acetate	1406012-02	1
Euro OTC	Prednisolone acetate	1406014-01	15
Gehe	Prednisolone acetate	1406014-01	1
Caelo	Prednisolone acetate	1406014-01	2
Lihua Pharma	Prednisolone acetate	1406014-01	1
Kehr	Prednisolone acetate	1406014-01	1
Euro OTC	Prednisolone acetate	1406014-02	14
Caelo	Prednisolone acetate	1406014-02	2
Caelo	Prednisolone acetate	14175508	15
AHD 06.03.15	Prednisolone acetate	14175508	1
Caelo	Prednisolone acetate	14175509	7
Cael Sanacorp 05.02.2016	Prednisolone acetate	14175509	1
Caelo	Prednisolone acetate	14175512	1
Caelo	Prednisolone acetate	14175513	12
noweda	Prednisolone acetate	14175513	1
Cealo	Prednisolone acetate	14175513	1
A.H.D.	Prednisolone acetate	14175514	1
Caelo	Prednisolone acetate	14380302	1
Caelo	Prednisolone acetate	14380901	13
Cael Sanacorp 05.02.2016	Prednisolone acetate	14380901	1
Caelo	Prednisolone acetate	14380902	9

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Supplier	Substance	Batch	Spectra
phönix	Prednisolone acetate	14380902	2
Caelo	Prednisolone acetate	14380905	15
Caelo	Prednisolone acetate	14380909	16
Phoenix	Prednisolone acetate	14380905	1
sanacorp	Prednisolone acetate	14380909	1
caesar&loretz	Prednisolone acetate	14380909	1
Caelo	Prednisolone acetate	14380910	12
phönix	Prednisolone acetate	14380910	1
Fagron	Prednisolone acetate	14380910	1
Wolf-Apotheke	Prednisolone acetate	14380911	1
phönix	Prednisolone acetate	1438910	1
Caelo	Prednisolone acetate	1475509	1
Euro OTC	Prednisolone acetate	1460614-01	1
Fagron	Prednisolone acetate	14D04-B03-299294	4
Noweda 18.05.2015	Prednisolone acetate	14D04-B03-299294	1
Fagron	Prednisolone acetate	14D04-B03-299295	1
Fagron	Prednisolone acetate	14D04B03299295	1
Fagron	Prednisolone acetate	14G30-B13-299293	2
Fagron	Prednisolone acetate	14G30-B13	1
Henan Lihua Pharmaceuti...	Prednisolone acetate	14G30-B13	1
Fagron	Prednisolone acetate	14G30-B13-302562	1
Euro OTC	Prednisolone acetate		1
Euro OTC	Prednisolone acetate	1501036	1
Euro OTC	Prednisolone acetate	1501036-01	15
Euro OTC	Prednisolone acetate	150103601	1
Euro OTC	Prednisolone acetate	1501036-02	21
Bombastus	Prednisolone acetate	1501036-02	1
Euroo/Gehe	Prednisolone acetate	1501036-02	1
Caelo	Prednisolone acetate	1501038-02	1
Caelo	Prednisolone acetate	15055201	8
15055201	Prednisolone acetate	15055201	1
AllianceHealthcare	Prednisolone acetate	15055201	1
Caelo	Prednisolone acetate	15055202	15
Beiersdorf AG	Prednisolone acetate	15055201	1
caesar&loretz,Phönix	Prednisolone acetate	15055202	2
Noweda	Prednisolone acetate	15055202	1
Caelo	Prednisolone acetate	15055203	3
Caelo	Prednisolone acetate	15055206	9
Sanacorp	Prednisolone acetate	15055206	1
EuRho	Prednisolone acetate	1512020-01	1
Euro OTC	Prednisolone acetate	1512020-01	27
phönix	Prednisolone acetate	1512020-01	1
Caelo	Prednisolone acetate	1512020-01	3
Euro OTC	Prednisolone acetate	151202001	1
Caelo	Prednisolone acetate	151202001	1
Fagron	Prednisolone acetate	1523-B04	1
Caelo	Prednisolone acetate	15398302	13
Caesar&Loretz GmbH	Prednisolone acetate	15396408	1
Caelo	Prednisolone acetate	15396304	1
Beiersdorf AG	Prednisolone acetate	15398302	1
Caesar&Loretz,Phönix,08...	Prednisolone acetate	15398302	1
Caesar&loretz,Phoenix,2...	Prednisolone acetate		1
	Prednisolone acetate	15398303	1
Caelo	Prednisolone acetate	15398303	9
Noweda	Prednisolone acetate	15398303	1
phönix	Prednisolone acetate	15398303	1
Phönix	Prednisolone acetate	15398303	1
Caelo	Prednisolone acetate	15398304	5
Caesar&loretz,AHC,29.08...	Prednisolone acetate	15398306	1
Caelo	Prednisolone acetate	15398306	2

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Supplier	Substance	Batch	Spectra
Caelo	Prednisolone acetate	15398307	11
Caelo	Prednisolone acetate	15398401	7
Caelo	Prednisolone acetate	15398402	6
phönix	Prednisolone acetate	15398402	1
Caelo	Prednisolone acetate	15398407	5
Sanacorp	Prednisolone acetate	15398408	1
Caelo	Prednisolone acetate	15398408	10
Fagron	Prednisolone acetate	15B03-B05	1
Caelo	Prednisolone acetate	15498303	1
Fagron	Prednisolone acetate	15803-B05	1
Fagron	Prednisolone acetate	15B03-B05-302564	5
Fagron	Prednisolone acetate	15b03-b05-302564	1
Fagron	Prednisolone acetate	15B03-B05-302566	3
Fagron	Prednisolone acetate	15B03-B05-308582	3
Fagron	Prednisolone acetate	15F29-B07-323268	1
Caelo	Prednisolone acetate	16/AKD2	1
Fagron	Prednisolone acetate	15123-B04-327929	1
Euro OTC	Prednisolone acetate	1607010-01	50
Caelo	Prednisolone acetate	160701001	1
Euro OTC	Prednisolone acetate	1607010-10	1
Caelo	Prednisolone acetate	16246801	7
Euro OTC	Prednisolone acetate	16246801	2
Caelo	Prednisolone acetate	16246802	6
Caelo	Prednisolone acetate	16246803	5
phönix	Prednisolone acetate	16246803	3
Caesar&LoretzGmbH,11,03…	Prednisolone acetate	16246803	1
Gehe	Prednisolone acetate	16246803	2
Caelo	Prednisolone acetate	16246804	6
Phönix	Prednisolone acetate	16246804	1
Caelo	Prednisolone acetate	16246806	3
Gehe	Prednisolone acetate	16246806	1
phönix	Prednisolone acetate	16246806	1
Caelo	Prednisolone acetate	16246807	5
phönix	Prednisolone acetate	16246807	1
Caelo	Prednisolone acetate	16246808	5
Caelo	Prednisolone acetate	16246809	1
Caelo	Prednisolone acetate	16246811	1
Caelo	Prednisolone acetate	1624806	1
Caelo	Prednisolone acetate	16246812	1
Caelo	Prednisolone acetate	1624801	1
Caelo	Prednisolone acetate	165246802	1
Euro OTC	Prednisolone acetate	1701041-01	5
Euro OTC	Prednisolone acetate	1701041-02	1
Caelo	Prednisolone acetate	17086102	3
Caelo	Prednisolone acetate	17086101	2
Caelo	Prednisolone acetate	17086103	5
Caesar&Loretz GmbH,PHön…	Prednisolone acetate	17086103	2
Caesar & Loretz GmbH, P…	Prednisolone acetate	17185601	1
Caelo	Prednisolone acetate	17086106	1
Bombastus	Prednisolone acetate	17185601	1
Caelo	Prednisolone acetate	17185602	1
Phönix	Prednisolone acetate	17185602	1
Caelo	Prednisolone acetate	17185603	1
Fagron	Prednisolone acetate	200540-0013	1
Euro OTC	Prednisolone acetate	2215I-02106	1
Bombastus	Prednisolone acetate	2255	1
Euro OTC	Prednisolone acetate	2714U-02106	1
Euro OTC	Prednisolone acetate	289295	1
Euro OTC	Prednisolone acetate	5012I-02106	1
Fagron	Prednisolone acetate	K07A20130903M	1

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Supplier	Substance	Batch	Spectra
Fragron	Prednisolone acetate	K07A20131101M	1
Fagron	Prednisolone acetate	K07D20150105M	1
Fagron	Prednisolone acetate	113Q-02106	1
Euro OTC	Prednisolone acetate	514U2106	1
Caelo	Prednisolone acetate	6021306	1
Fagron	Prednisolone acetate	6082013D	2
Euro OTC	Prednisolone acetate	711212106	1
Caelo	Prednisolone acetate	11080403	1
Euro OTC	Prednisolone acetate	1108043-01	4
EuRho/G	Prednisolone acetate	1108043-02	1
Caelo	Prednisolone acetate	11158002	1
Caelo	Prednisolone acetate	11158003	1
Phoenix	Prednisolone acetate	11158007	1
Caelo	Prednisolone acetate	11158007	1
Phönix	Prednisolone acetate	11158008	1
Kehr	Prednisolone acetate	1158007	1
Fagron	Prednisolone acetate	11A31-N03	1
Noweda	Prednisolone acetate	11I09-N08	1
Fagron	Prednisolone acetate	11I09N-08	1
Fagron	Prednisolone acetate	11I09-N08	1
Fagron	Prednisolone acetate	11L21-N03	1
Caelo	Prednisolone acetate	11L21-N03	2
Fargo	Prednisolone acetate	12025-N05	1
Euro OTC	Prednisolone acetate	1209028	1
Euro OTC	Prednisolone acetate	1209028-01	4
Caelo	Prednisolone acetate	1209028-01	2
Noweda	Prednisolone acetate	1209028-01	1
Caelo	Prednisolone acetate	1209028-02	2
Phönix	Prednisolone acetate	1209028-02	1
Gehe	Prednisolone acetate	1209028-02	1
Caelo	Prednisolone acetate	12091802	8
ANZAG	Prednisolone acetate	12091802	2
Anzag, 24.10.2012	Prednisolone acetate	12091802	1
Caelo	Prednisolone acetate	12091803	6
Fagron	Prednisolone acetate	12091803	1
Caelo	Prednisolone acetate	12091807	7
Alliance Healthcare	Prednisolone acetate	12091807	1
Caelo	Prednisolone acetate	12091808	4
Sanacorp	Prednisolone acetate	12091808	1
Anzag 01.02.2013	Prednisolone acetate	12091813	1
Caelo	Prednisolone acetate	12091814	7
Caelo	Prednisolone acetate	12091815	2
Fagron	Prednisolone acetate	12324502	1
Caelo	Prednisolone acetate	12324502	15
Caelo	Prednisolone acetate	12324505	16
Phönix	Prednisolone acetate	12324505	1
Phönix	Prednisolone acetate	12324506	1
Noweda	Prednisolone acetate	12324506	1
AHD, 08.11.13	Prednisolone acetate	12324506	1
Caelo	Prednisolone acetate	1234502	1
Caelo	Prednisolone acetate	1234506	2
Fagron	Prednisolone acetate	12C19-N03	4
Fagron	Prednisolone acetate	12C19-N03	1
FARGON	Prednisolone acetate	12g25-n05	1
Gehe	Prednisolone acetate	12H14-N07	1
Fagron	Prednisolone acetate	12H14-N07	4
Fagron	Prednisolone acetate	12J10/N05	1
Fagron	Prednisolone acetate	12J10-N05	1
FARGON	Prednisolone acetate	12l05-n01	1
Fagron	Prednisolone acetate	12L11-B04-286905	1

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Supplier	Substance	Batch	Spectra
Symbiotika/Anzag	Prednisolone acetate	1306040-01	1
Caelo	Prednisolone acetate	1306040-01	1
Euro OTC	Prednisolone acetate	130604002	1
Fagron	Prednisolone acetate	13a07n07	1
Caesar&loretz,Phoenix	Prednisolone acetate	13262606	1
Caelo	Prednisolone acetate	13A07-N07	2
Anzag	Prednisolone acetate	13A07N07	1
A.H. 23.05.13 ek: 5,40EUR	Prednisolone acetate	13A07-N07	1
Fargon	Prednisolone acetate	13A07-N07	1
Caelo	Prednisolone acetate		2
Caesar&loretz,Phoenix	Prednisolone acetate	14175513	1
apo-ident	Prednisolone acetate	1512020-01	1
Caelo	Prednisolone acetate	1616I-02106	1
Fagron	Prednisolone acetate	180713a	1
Euro OTC	Prednisolone acetate	200540	1
Euro OTC	Prednisolone acetate	2413Q02106	1
Euro OTC	Prednisolone acetate	2507212106	1
Caelo	Prednisolone acetate	27051301	1
Euro OTC	Prednisolone acetate	2902212106	1
Caelo	Prednisolone acetate	4313A-02106	1
Euro OTC	Prednisolone acetate	K07A20140304M	1
Euro OTC	Prednisolone acetate	PAC-BLT003/0812	1
Fagron	Prednisolone acetate	12H14-N07	1
Gehe	Prednisolone acetate	13262609	1

- 76 179 spectra from 462 *Apo-Ident* customers from a total of 25 362 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Prednisolone acetate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Prednisolone acetate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	369	0	72 064
Type B	0	344	0	161 729
Type C	0	918	62	76 179

The substance/substance group *Prednisolone acetate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9887 %)	100.0000 % (> 98.3740 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 98.2558 %)
Type C	100.0000 % (> 99.8849 %)	93.6735 % (> 93.3673 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several

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new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20784	22297	9.03	46.91
20795	22297	8.68	41.74
20877	22297	4.93	48.42
21096	22297	8.44	42.55
21450	22297	13.30	42.60
21530	21530	0.00	43.61
22297	22297	0.00	48.74

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Prednisolone hydrogen succinate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20838-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Prednisolone hydrogen succinate; Prednisoloni hydrogenosuccinas

Special notes

When selecting the *Prednisolone hydrogen succinate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Prednisolone hydrogen succinate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Prednisolone hyd…	13D16-N11	20956	40	1509250
Fagron	Prednisolone hyd…	14G29-B07-304733	22652	40	1701370

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 80 spectra of 2 reference samples from the substance/substance group *Prednisolone hydrogen succinate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 2 different batches.

- 72 353 spectra from a total of 1580 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 120 spectra from 3 reference samples of the substance/substance group *Prednisolone hydrogen succinate*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Prednisolone hydrogen succin…	12A20-N11	20838	40
Fagron	Prednisolone hydrogen succin…	14G29-B07-304733	22723	40
Fagron	Prednisolone hydrogen succin…	15C11-B05-344778	24058	40

- 161 953 spectra from a total of 3496 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

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- 6 spectra from 4 *Apo-Ident* customers from 6 batches from the substance/substance group *Prednisolone hydrogen succinate*.

- These include spectra of independent samples from 5 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Prednisolone hydrogen succin…	12A20-N11	1
Phönix	Prednisolone hydrogen succin…	13H24-N04	1
Fagron	Prednisolone hydrogen succin…	14G29-B07	1
Fagron	Prednisolone hydrogen succin…	14G29-B07-304733	1
Caelo	Prednisolone hydrogen succin…	15C11-B05-305533	1
Caelo	Prednisolone hydrogen succin…	19081502	1

- 77 153 spectra from 463 *Apo-Ident* customers from a total of 25 541 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Prednisolone hydrogen succinate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Prednisolone hydrogen succinate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	80	0	72 353
Type B	0	120	0	161 953
Type C	0	6	0	77 153

The substance/substance group *Prednisolone hydrogen succinate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 95.0000 %)
Type C	100.0000 % (> 99.8852 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20956	20956	0.00	36.40
22652	22652	0.00	33.75

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Prednisolone, micronized**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20773-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Prednisolone, micronized; Prednisolonum micronisatum

Special notes

When selecting the *Prednisolone, micronized* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Prednisolone, micronized*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Prednisolone, mi…	12324202	20773	40	20121113
Caelo	Prednisolone, mi…	12324226	21303	39	1411271
Caelo	Prednisolone, mi…	13343105	21449	40	1411232
Euro OTC	Prednisolone, mi…	1212021-02	21604	40	1411270
Fagron	Prednisolone, mi…	13H07-B02-285592	21660	40	20130909

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Prednisolone, mi...	1501047-01	21849	40	AR-15-FG-015509-01
Caelo	Prednisolone, mi...	154000	22435	40	20160225*
Caelo	Prednisolone, mi...	161343	22467	40	20160601*
Fagron	Prednisolone, mi...	14I10-B03-302263	22651	40	20141020
Euro OTC	Prednisolone, mi...	1607011	22709	40	20160818*
Caelo	Prednisolone, mi...	15400002	22783	40	20160225
Fagron	Prednisolone, mi...	16C15-B01-320761	22803	40	20160407
Euro OTC	Prednisolone, mi...	1212021-02	21604SI	33	1411270
Fagron	Prednisolone, mi...	13H07-B02-285592	21660SI	40	20130909
Euro OTC	Prednisolone, mi...	1501047-01	21849SI	20	AR-15-FG-015509-01
Caelo	Prednisolone, mi...	154000	22435SI	39	20160225*
Caelo	Prednisolone, mi...	161343	22467SI	32	20160601*
Fagron	Prednisolone, mi...	14I10-B03-302263	22651SI	40	20141020
Euro OTC	Prednisolone, mi...	1607011	22709SI	40	20160818*
Caelo	Prednisolone, mi...	15400002	22783SI	40	20160225
Fagron	Prednisolone, mi...	16C15-B01-320761	22803SI	36	20160407

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 799 spectra of 21 reference samples from the substance/substance group *Prednisolone, micronized*. These samples are listed above in the section *calibration samples*. The reference samples originate from 12 different batches.

- 71 634 spectra from a total of 1570 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 599 spectra from 22 reference samples of the substance/substance group *Prednisolone, micronized*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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- These include spectra of independent samples from 7 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Prednisolone, micronized	81798119	20023	50
Fagron	Prednisolone, micronized	1108055-04	20855	30
Fagron	Prednisolone, micronized	zu erfassen	21008	30
Fagron	Prednisolone, micronized	09K05-N02	21019	30
Caelo	Prednisolone, micronized	13343105	21449†	20
Euro OTC	Prednisolone, micronized	1212021-02	21604†	20
Fagron	Prednisolone, micronized	13H07-B02-285592	21660†	20
Euro OTC	Prednisolone, micronized	1501047-01	21849†	20
Caelo	Prednisolone, micronized	154000	22435†	20
Caelo	Prednisolone, micronized	161343	22467†	20
Euro OTC	Prednisolone, micronized	1702020	23180	40
Fagron	Prednisolone, micronized	16E09-B07-328220	23260	40
Caelo	Prednisolone, micronized	172777	23846	40
Caelo	Prednisolone, micronized	13343105	21451SI	60
Euro OTC	Prednisolone, micronized	1212021-02	21604SI†	15
Fagron	Prednisolone, micronized	13H07-B02-285592	21660SI†	20
Euro OTC	Prednisolone, micronized	1501047-01	21849SI†	10
Caelo	Prednisolone, micronized	154000	22435SI†	20
Caelo	Prednisolone, micronized	161343	22467SI†	15
Euro OTC	Prednisolone, micronized	1702020	23180SI	21
Fagron	Prednisolone, micronized	16E09-B07-328220	23260SI	20
Caelo	Prednisolone, micronized	172777	23846SI	38

- 161 474 spectra from a total of 3487 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 873 spectra from 279 *Apo-Ident* customers from 213 batches from the substance/substance group *Prednisolone, micronized*.

- These include spectra of independent samples from 203 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Euro OTC	Prednisolone, micronized	1108055-04	27
Euro OTC	Prednisolone, micronized	501047-01	1
Fagron	Prednisolone, micronized	613Q-02105	1
Caelo	Prednisolone, micronized	10196606	1

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†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Supplier	Substance	Batch	Spectra
Caelo	Prednisolone, micronized	10196626	7
Euro OTC	Prednisolone, micronized	110805502	1
Noweda	Prednisolone, micronized	1108055-05	1
Euro OTC	Prednisolone, micronized	12021-03	1
Euro OTC	Prednisolone, micronized	121021-01	2
Euro OTC	Prednisolone, micronized	1212021	1
Euro OTC	Prednisolone, micronized	1212021-01	28
Caelo	Prednisolone, micronized	1212021-01	1
Euro OTC	Prednisolone, micronized	121202101	1
euroct/gehe	Prednisolone, micronized	1212021-01	2
Gehe	Prednisolone, micronized	1212021-01	4
Tianyao Pharma/Phönix	Prednisolone, micronized	1212021-01	1
Euro OTC	Prednisolone, micronized	1212021-02	29
Caelo	Prednisolone, micronized	121202102	1
Noweda	Prednisolone, micronized	1212021-02	1
Euro OTC	Prednisolone, micronized	121202102	1
Euro OTC	Prednisolone, micronized	1212021-03	24
Caelo	Prednisolone, micronized	1212021-03	5
AHD	Prednisolone, micronized	121202103	1
Euro/ Sanacorp	Prednisolone, micronized	121202103	1
Euro OTC	Prednisolone, micronized	121221-03	1
Caelo	Prednisolone, micronized	12324213	7
Caelo	Prednisolone, micronized	12324217	7
Caelo	Prednisolone, micronized	12324220	2
Caelo	Prednisolone, micronized	12324221	4
Caelo	Prednisolone, micronized	12324226	10
Caelo	Prednisolone, micronized	1234556	1
Euro OTC	Prednisolone, micronized	1314Q2105	1
Fagron	Prednisolone, micronized	130F-N04	1
Caelo	Prednisolone, micronized	13343101	1
Caelo	Prednisolone, micronized	133414	1
Caelo	Prednisolone, micronized	13343104	10
Euro OTC	Prednisolone, micronized	13343104	1
Caelo	Prednisolone, micronized	13343105	6
Phönix Gotha	Prednisolone, micronized	13343105	1
Caelo	Prednisolone, micronized	13343106	9
Fagron	Prednisolone, micronized	13343106	1
Caelo	Prednisolone, micronized	13343107	2
Gehe	Prednisolone, micronized	13343107	1
Caelo	Prednisolone, micronized	13343111	5
Phönix Gotha	Prednisolone, micronized	13343111	1
Phönix Gotha	Prednisolone, micronized	13343112	2
Caelo	Prednisolone, micronized	13343113	2
Caelo	Prednisolone, micronized	13343114	5
Caelo	Prednisolone, micronized	13343112	1
Caesar&Loretz GmbH/Anzag	Prednisolone, micronized	13343112	1
Berkel AHK	Prednisolone, micronized	13343115	1
Caelo	Prednisolone, micronized	13343115	9
Caelo	Prednisolone, micronized	13343116	4
Fagron	Prednisolone, micronized	13A07-N14	8
Fagron	Prednisolone, micronized	13A07N14	1
Fagron	Prednisolone, micronized	13E13-N06	1
Fagron	Prednisolone, micronized	13E15-N06	18
Caelo	Prednisolone, micronized	13E15-N06	6
Fagron	Prednisolone, micronized	13G03-B09-289668	1
Fagron	Prednisolone, micronized	13H07-B02	2
Fagron	Prednisolone, micronized	13H07-B020	1
Caelo	Prednisolone, micronized	13H07-B02-285590	1
Fagron	Prednisolone, micronized	13H07-B02-285590	4
Fagron	Prednisolone, micronized	13H07-B02-285592	4

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Supplier	Substance	Batch	Spectra
Fagron	Prednisolone, micronized	13H07-B02-285593	4
Fagron	Prednisolone, micronized	13H07-B02-285593	1
Fagron	Prednisolone, micronized	13H7-B02-285590	1
Fagron	Prednisolone, micronized	13J28-B06	2
Fagron	Prednisolone, micronized	13J28-B06-289670	5
Sanacorp	Prednisolone, micronized	13j28-b06-289670	1
Fagron	Prednisolone, micronized	14/10-B03	1
Fagron	Prednisolone, micronized		2
Caelo	Prednisolone, micronized	14/10B03302265	1
Fagron	Prednisolone, micronized	14/10B03302265	1
Fagron	Prednisolone, micronized	14/10-B03-302265	3
sanacorp	Prednisolone, micronized	14/10-B03-302266	1
Fagron	Prednisolone, micronized	14/10-B03-302266	2
Sanacorp	Prednisolone, micronized	14/10-B03-302269	1
Fagron	Prednisolone, micronized	14/10-B03-302269	1
Fagron	Prednisolone, micronized	1410-B03	1
Caelo	Prednisolone, micronized	1410B03302265	1
Fagron	Prednisolone, micronized	1410-B03-302269	1
Fagron	Prednisolone, micronized	14A30-B02-294968	4
Fischar/Gehe	Prednisolone, micronized	14A30-B02-294968	1
Caelo	Prednisolone, micronized	14A30-B02-294968	1
Fagron	Prednisolone, micronized	14B18-B05	1
Phönix	Prednisolone, micronized	14B18-B05-294966	1
anzag	Prednisolone, micronized	14B18-B05-294966	1
Fagron	Prednisolone, micronized	14B18-B05-294966	11
Caelo	Prednisolone, micronized	14B18-B05-294966	2
Fagron	Prednisolone, micronized	14B18-B05294966	1
Fagron	Prednisolone, micronized	14B18-B05-294969	2
Gehe-Fragon	Prednisolone, micronized	14B18B05294966	1
Fagron	Prednisolone, micronized	14B18-Bo5-294966	1
Fagron	Prednisolone, micronized	14G30-B14	1
Fagron	Prednisolone, micronized	14G30-B14-302262	4
Caelo	Prednisolone, micronized	14G30-B14-302262	1
Fagron	Prednisolone, micronized	14I10-B03	2
Fagron	Prednisolone, micronized	14I10-B03-302266	1
Fagron	Prednisolone, micronized	14I10-B03-302265	1
Fagron	Prednisolone, micronized	14L10-B03-302269	1
Fagron	Prednisolone, micronized	14I10-B03-302269	1
Fagron	Prednisolone, micronized	14l10-B03302265	1
Fagron	Prednisolone, micronized	14i10-b03-302269	1
Euro OTC	Prednisolone, micronized	1501047-01	15
Euro OTC	Prednisolone, micronized	1501047	1
Euro OTC	Prednisolone, micronized	150104701	2
Caelo	Prednisolone, micronized	150104701	2
Caelo	Prednisolone, micronized	1501047-01	3
Henan Lihua/Gehe	Prednisolone, micronized	1501047-01	1
Euro OTC	Prednisolone, micronized	1501047-02	11
Bombastus	Prednisolone, micronized	1501047-02	1
Euro OTC	Prednisolone, micronized	150104747-01	1
Caelo	Prednisolone, micronized	15055101	5
Caelo	Prednisolone, micronized	15055102	6
Caelo	Prednisolone, micronized	152006105	1
Caelo	Prednisolone, micronized	15206101	9
Caesar & Loretz GmbH	Prednisolone, micronized	15206101	3
Noweda	Prednisolone, micronized	15206101	1
Caelo	Prednisolone, micronized	15206102	11
Caelo	Prednisolone, micronized	15206103	11
Caelo	Prednisolone, micronized	15206105	5
Caelo	Prednisolone, micronized	15206108	10
Caelo	Prednisolone, micronized	15206106	1

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Supplier	Substance	Batch	Spectra
Cealo/Noweda	Prednisolone, micronized	1526108	1
Caelo	Prednisolone, micronized	15400002	8
Caelo	Prednisolone, micronized	15400003	17
Phoenix	Prednisolone, micronized	15400003	1
Caelo	Prednisolone, micronized	15400004	8
Caelo	Prednisolone, micronized	15400010	1
Caelo	Prednisolone, micronized	1540003	1
Fagron	Prednisolone, micronized	15B18-B05-294969	1
Fagron	Prednisolone, micronized	15D14-B01	1
Fagron	Prednisolone, micronized	15D14-B01-308425	2
Fagron	Prednisolone, micronized	15K03-B04	1
Fagron	Prednisolone, micronized	15K03-B04-314226	9
Sanacorp	Prednisolone, micronized	15K03-B04-314226	1
Fagron	Prednisolone, micronized	15K03B04314226	1
Fagron	Prednisolone, micronized	15k03-b04-314226	2
Fragon/Phoenix	Prednisolone, micronized	15K03-B04-314226	1
Fagron	Prednisolone, micronized	15K03-B04-314358	6
Caelo	Prednisolone, micronized	15K03-B04-314358	1
Fagron	Prednisolone, micronized	15K03-B04-314869	1
Fagron	Prednisolone, micronized	15KO3-B04-314226	1
Euro OTC	Prednisolone, micronized	1607011-01	12
AHD	Prednisolone, micronized	160711-01	1
Caelo	Prednisolone, micronized	16134301	5
Caelo	Prednisolone, micronized	16134302	6
Gehe	Prednisolone, micronized	16134302	1
Caelo	Prednisolone, micronized	16134305	4
Euro OTC	Prednisolone, micronized	16134308	3
Caelo	Prednisolone, micronized	16134308	2
Fargon	Prednisolone, micronized	16134308	1
Caelo	Prednisolone, micronized	16134316	1
Caelo	Prednisolone, micronized	16134310	1
Fagron	Prednisolone, micronized	16A20-B03	3
Fagron	Prednisolone, micronized	16A20-B03-316420	4
Fagron	Prednisolone, micronized	16A20-B03-316421	1
Fagron	Prednisolone, micronized	16A20-B03-319015	1
Fagron	Prednisolone, micronized	16C15-B01	1
Fagron	Prednisolone, micronized	16C15-B01-319992	1
Caelo	Prednisolone, micronized	16C15-B01-320761	1
Caelo	Prednisolone, micronized	16C15-B01320761	1
Fagron	Prednisolone, micronized	16c15-B01-320761	1
Fagron	Prednisolone, micronized	16C15-B01-320761	2
Ichthyol / Phoenix	Prednisolone, micronized	16C15-B01-320761	1
Fagron	Prednisolone, micronized	16C15-B01-321979	5
Caelo	Prednisolone, micronized	16C15-B01-321979	1
Fagron	Prednisolone, micronized	16C15B01321979	1
Fagron	Prednisolone, micronized	16C15-B02-324943	2
Fagron	Prednisolone, micronized	16E09-B07-328150	2
Gehe/Fragon	Prednisolone, micronized	16E09B07328150	1
Fagron	Prednisolone, micronized	16H04-B03-332929	1
Fagron	Prednisolone, micronized	16E09-B07-329686	1
Euro OTC	Prednisolone, micronized	1702020-01	1
Caelo	Prednisolone, micronized	19081504	1
Euro OTC	Prednisolone, micronized	30042014B	1
Caelo	Prednisolone, micronized	4712I-02105	1
Caelo	Prednisolone, micronized	k04c20121219	1
Fagron	Prednisolone, micronized	K04C20131102	1
Caelo	Prednisolone, micronized		1
Fagron	Prednisolone, micronized	K04C20130203M	1
Fagron	Prednisolone, micronized	K04C20140502	1
Fagron	Prednisolone, micronized	KO4C20121006	1

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Supplier	Substance	Batch	Spectra
Caelo	Prednisolone, micronized	9244213	1
Caelo	Prednisolone, micronized	P142/14	1
EuRho	Prednisolone, micronized	1012012-02	2
EuRho	Prednisolone, micronized	1012012-01	1
Caelo	Prednisolone, micronized	1012012-02	1
Caelo	Prednisolone, micronized	10196611	3
Caelo	Prednisolone, micronized	10196614	1
Kehr	Prednisolone, micronized	10196622	1
Caelo	Prednisolone, micronized	10196622	2
Caelo	Prednisolone, micronized	10196623	1
Caelo	Prednisolone, micronized	10196625	1
Phönix Gotha	Prednisolone, micronized	10196626	2
Caelo	Prednisolone, micronized	10196627	11
Caelo	Prednisolone, micronized	11/26-N04	1
Euro OTC	Prednisolone, micronized	1108055-02	5
Euro OTC	Prednisolone, micronized	1108055-03	12
Fagron	Prednisolone, micronized	11D13-N05	1
Fagron	Prednisolone, micronized	11G22-N08	2
Fagron	Prednisolone, micronized	11J26-N04	3
Caelo	Prednisolone, micronized	12171301	6
Noweda	Prednisolone, micronized	12C22-N05	1
Fagron	Prednisolone, micronized	12C22-N05	8
Phoenix	Prednisolone, micronized	11j26-N04	2
Gehe	Prednisolone, micronized	12C22-N05	1
A.H. 05.03.13 ek: 14,08EUR	Prednisolone, micronized	12D30-N04	1
Noweda	Prednisolone, micronized	9244213	1
Caelo	Prednisolone, micronized	1511011	1
Caelo	Prednisolone, micronized	9193501	1
europharma	Prednisolone, micronized	1002001240	1
Alliance Health 04.01.2...	Prednisolone, micronized	1012012-01	1
Caelo	Prednisolone, micronized	1012012-01	1
Euro OTC	Prednisolone, micronized	1012012-02	2
Caelo	Prednisolone, micronized	1019611	1
Caelo	Prednisolone, micronized	10196604	1
Caelo	Prednisolone, micronized	10196619	1
Noweda	Prednisolone, micronized	10196626	2
Euro OTC	Prednisolone, micronized	1108055-01	1
Sanacorp	Prednisolone, micronized	1108055-03	1
EuRho	Prednisolone, micronized	1108055-03	2
Europharm/Otto	Prednisolone, micronized	1108055-03	1
Europharm/Otto	Prednisolone, micronized	1108055-04	5
Euro OTC	Prednisolone, micronized	110805504	6
EuRho/Jenne	Prednisolone, micronized	1108055-04	2
Apotheke Mildenau	Prednisolone, micronized	1108055-04	3
Caelo	Prednisolone, micronized	1108055-04	1
Sanacorp	Prednisolone, micronized	110805504	1
Euro OTC	Prednisolone, micronized	110855-02	1
Euro OTC	Prednisolone, micronized	118055-04	1
Sanacorp	Prednisolone, micronized	1212021	1
Caelo	Prednisolone, micronized	12171302	1
Caelo	Prednisolone, micronized	12171303	3
Anzag 15.10.12	Prednisolone, micronized	12171303	1
Gehe	Prednisolone, micronized	12171302	1
Caelo	Prednisolone, micronized	12171306	2
Phönix Gotha	Prednisolone, micronized	12185702	1
Phoenix, 03.09.2012	Prednisolone, micronized	12185702	1
Caelo	Prednisolone, micronized	12185702	2
Caelo	Prednisolone, micronized	1232417	1
Phönix Gotha	Prednisolone, micronized	1232417	1
Fagron	Prednisolone, micronized	12324202	1

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Supplier	Substance	Batch	Spectra
Caelo	Prednisolone, micronized	12324202	11
Caelo	Prednisolone, micronized	12324203	6
Phönix Gotha	Prednisolone, micronized	12324204	1
Caelo	Prednisolone, micronized	12324204	4
Caesar/Lorenz	Prednisolone, micronized	12324204	1
Caelo	Prednisolone, micronized	12324205	15
Caesar & Loretz GmbH	Prednisolone, micronized	12324205	1
Caelo	Prednisolone, micronized	12324207	4
Phönix Gotha	Prednisolone, micronized	12324207	1
Caelo	Prednisolone, micronized	12324206	1
Gehe 03.07.2013	Prednisolone, micronized	12324207	1
Phönix Gotha	Prednisolone, micronized	12324213	1
Caelo	Prednisolone, micronized	12324216	16
Phönix	Prednisolone, micronized	12324216	1
Phönix Gotha	Prednisolone, micronized	12324217	1
Gehe	Prednisolone, micronized	12324219	2
Caelo	Prednisolone, micronized	12324219	11
Sonnenberg-Apotheke	Prednisolone, micronized	12324219	1
Caesar & Loretz GmbH	Prednisolone, micronized	12324219	1
Sanacorp	Prednisolone, micronized	12324221	1
Caelo	Prednisolone, micronized	123242216	1
Caelo	Prednisolone, micronized	1234205	1
Fagron	Prednisolone, micronized	12c22-N05	2
FARGON	Prednisolone, micronized	12c22-n05	1
Fagron	Prednisolone, micronized	12C22N05	1
Fagron	Prednisolone, micronized	12D30N04	1
Fagron	Prednisolone, micronized	12D30-N04	12
Fargo	Prednisolone, micronized	12D30-N04	1
Fagron	Prednisolone, micronized	12D30-no4	1
Fagron	Prednisolone, micronized	12K14-N03	11
Fagron	Prednisolone, micronized	12D30-NO4	1
Unisan	Prednisolone, micronized	12K14N-N03	1
Fagron	Prednisolone, micronized	12K14-NO3	1
Gehe	Prednisolone, micronized	13A07-N14	2
Caelo	Prednisolone, micronized	13A07-N14	2
Phönix	Prednisolone, micronized	13A07N14	1
Fagron	Prednisolone, micronized	13DE15-N06	1
Fargron	Prednisolone, micronized	13E15-N06	1
Caelo	Prednisolone, micronized	13e15-n06	2
Phönix	Prednisolone, micronized	13E15-N06	2
Sanacorp	Prednisolone, micronized	13E15-N06	1
AHD, 28.11.13	Prednisolone, micronized	13E15-N06	1
Gehe	Prednisolone, micronized	13E15-No6	1
Fagron	Prednisolone, micronized	13E15-NO6	1
Phönix	Prednisolone, micronized	15206103	1
Caelo	Prednisolone, micronized	20021303	1
Caelo	Prednisolone, micronized	2413Q02105	1
Caelo	Prednisolone, micronized	411092-1-P	1
Caelo	Prednisolone, micronized	26131-02105	1
Fagron	Prednisolone, micronized	4313E-02105	1
Caelo	Prednisolone, micronized	4513U2105	1
Fargon	Prednisolone, micronized	FPO1409P	1
Fagron	Prednisolone, micronized	K04C20121006	1
Fagron	Prednisolone, micronized	Ch12D30-N04	1
Euro OTC	Prednisolone, micronized	NEPL110103	1
Fagron	Prednisolone, micronized	nepl120802	1
Tianyao Pharma/Phönix	Prednisolone, micronized	NEPL110103	1
Fagron	Prednisolone, micronized	NEPL151202	1
Fagron	Prednisolone, micronized	11g22-n08	1

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- 76 286 spectra from 463 *Apo-Ident* customers from a total of 25 338 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Prednisolone, micronized* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Prednisolone, micronized* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	799	0	71 634
Type B	0	577	22	161 474
Type C	0	862	11	76 286

The substance/substance group *Prednisolone, micronized* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9887 %)	100.0000 % (> 99.2491 %)
Type B	100.0000 % (> 99.9928 %)	96.3272 % (> 95.8264 %)
Type C	100.0000 % (> 99.8849 %)	98.7400 % (> 98.3963 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20773	21449	17.22	36.14
21303	21303	0.00	29.48
21449	21449	0.00	29.07
21604	21604	0.00	37.02
21660	21449	4.03	29.76
21849	21849	0.00	27.63
22435	22435	0.00	39.56

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Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
22467	22467	0.00	24.74
22651	21303	12.55	39.45
22709	22709	0.00	36.76
22783	22435	5.87	36.98
22803	21604	6.01	37.25

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Prednisone**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20002-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Prednisone; Prednisonum

Special notes

When selecting the *Prednisone* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Prednisone*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Prednisone	12232716	21408	40	20120829
Euro OTC	Prednisone	1401042-02	21616	40	1605276
Euro OTC	Prednisone	1604051	22557	40	20160523*
Fagron	Prednisone	16J19-B02-328642	23227	40	20161221
Caelo	Prednisone	12232716	21408SI	40	20120829
Euro OTC	Prednisone	1604051	22557SI	40	20160523*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 240 spectra of 6 reference samples from the substance/substance group *Prednisone*. These samples are listed above in the section *calibration samples*. The reference samples originate from 4 different batches.

- 72 193 spectra from a total of 1578 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 520 spectra from 15 reference samples of the substance/substance group *Prednisone*.

- These include spectra of independent samples from 6 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Prednisone	72123189	20002	31
Caelo	Prednisone	10037803	20109	40
Caelo	Prednisone	12232716	21408†	20
Caelo	Prednisone	12232716	21409	60
Fagron	Prednisone	13C14-B40-289148	21573	60
Euro OTC	Prednisone	1401042-02	21616†	20
Euro OTC	Prednisone	1702008	23179	40
Caelo	Prednisone	171665	23341	20
Caelo	Prednisone	17166504	23578	30
Caelo	Prednisone	12232716	21408SI†	20
Caelo	Prednisone	12232716	21409SI	60
Euro OTC	Prednisone	1702008	23179SI	29

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*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Prednisone	16J19-B02-328642	23227SI	30
Caelo	Prednisone	171665	23341SI	30
Caelo	Prednisone	17166504	23578SI	30

- 161 553 spectra from a total of 3490 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 45 spectra from 26 *Apo-Ident* customers from 30 batches from the substance/substance group *Prednisone*.

- These include spectra of independent samples from 29 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Prednisone	204312107	1
Caelo	Prednisone	10037803	1
Caelo	Prednisone	10037817	4
Caelo	Prednisone	10037826	1
Phönix	Prednisone	11D08-N05	1
Caelo	Prednisone	12177604	2
Caelo	Prednisone	12232705	3
Caelo	Prednisone	12232713	1
Gehe	Prednisone	12232714	1
Caelo	Prednisone	12232714	1
Fagron	Prednisone	12E02-N01	1
Gehe	Prednisone	12L14-M03	1
Fagron	Prednisone	12E02-N10	1
Caelo	Prednisone	13262302	1
sanacorp	Prednisone	13262302	1
Caelo	Prednisone	13262304	1
Fagron	Prednisone	13C13-N08	1
Gehe	Prednisone	13C13-N08	1
Euro OTC	Prednisone	1401042-02	1
Euro OTC	Prednisone	1501043-03	1
Caelo	Prednisone	15218602	4
Caelo	Prednisone	15218606	4
Fagron	Prednisone	15218608	1
Caelo	Prednisone	16277203	1
Caelo	Prednisone	16277206	1
Fagron	Prednisone	16H04-B04-334368	1
Caelo	Prednisone	17166507	1
Fagron	Prednisone	21021401	1

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[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Supplier	Substance	Batch	Spectra
Caelo	Prednisone	2114Q2107	1
Caelo	Prednisone	28021401	1
Caelo	Prednisone	28021403	1
Caelo	Prednisone	5087	1
Euro/phönix	Prednisone	140104-02	1

- 77 114 spectra from 463 *Apo-Ident* customers from a total of 25 517 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Prednisone* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Prednisone* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	240	0	72 193
Type B	0	520	0	161 553
Type C	0	43	2	77 114

The substance/substance group *Prednisone* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.5000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 98.8462 %)
Type C	100.0000 % (> 99.8850 %)	95.5556 % (> 88.8889 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

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Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21408	21616	10.93	33.64
21616	21616	0.00	27.91
22557	22557	0.00	24.45
23227	21616	5.05	31.60

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Pregnenolone**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20721-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Pregnenolone; Pregnenolonum

Special notes

When selecting the *Pregnenolone* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Pregnenolone*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Pregnenolone	1204040-01	20721	40	1404311
Euro OTC	Pregnenolone	1312007-01	21679	40	8985
Fagron	Pregnenolone	15B11-B07-310278	22355	30	9338
Euro OTC	Pregnenolone	1602001	22375	30	20160208*
Euro OTC	Pregnenolone	1612019	22979	40	20170131*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 180 spectra of 5 reference samples from the substance/substance group *Pregnenolone*. These samples are listed above in the section *calibration samples*. The reference samples originate from 5 different batches.

- 72 253 spectra from a total of 1577 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 170 spectra from 6 reference samples of the substance/substance group *Pregnenolone*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Pregnenolone	2903030-02	20612	40
Euro OTC	Pregnenolone	1312007-01	21679†	20
Fagron	Pregnenolone	15B11-B07-310278	22355†	15
Euro OTC	Pregnenolone	1602001	22375†	15
Euro OTC	Pregnenolone	1606028	22706	40
Euro OTC	Pregnenolone	1709017	23696	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 903 spectra from a total of 3493 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 17 spectra from 7 *Apo-Ident* customers from 15 batches from the substance/substance group *Pregnenolone*.

- These include spectra of independent samples from 14 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Euro OTC	Pregnenolone	1402025-01	1
Fagron	Pregnenolone	14B18-B04-291917	1
Euro OTC	Pregnenolone	1602001-01	1
Fagron	Pregnenolone	16L29-B02331611	1
Haihang Industry	Pregnenolone	20140329	1
gehe	Pregnenolone	Apc07160801	1
Audor Pharma	Pregnenolone	APC07-150801(M)P	1
NWM CHina	Pregnenolone	PR150329	1
Euro OTC	Pregnenolone	1312007-01	1
NWM Shandong Northwest ...	Pregnenolone	PRN151219	1
Audor Pharma	Pregnenolone	AP10L10-M01P	1
Audor Pharma	Pregnenolone	AP1109007-01P	3
KS Pharma	Pregnenolone	ZH-111119	1
Koisser	Pregnenolone	ZH-130802	1
Koisser Pharma	Pregnenolone	ZH-131001	1

- 77 142 spectra from 463 *Apo-Ident* customers from a total of 25 532 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Pregnenolone* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Pregnenolone* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	180	0	72 253
Type B	0	170	0	161 903
Type C	0	17	0	77 142

The substance/substance group *Pregnenolone* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.6667 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 96.4706 %)
Type C	100.0000 % (> 99.8850 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20721	20721	0.00	19.00
21679	21679	0.00	17.53
22355	22355	0.00	21.25
22375	22375	0.00	17.53
22979	22979	0.00	18.12

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Prilocaine hydrochloride**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	21048-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Prilocaine hydrochloride; Prilocaini hydrochloridum; Prilocainum hydrochloricum

Special notes

When selecting the *Prilocaine hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Prilocaine hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Prilocaine hydro…	13I02-N03	21048	40	1403257
Fagron	Prilocaine hydro…	14H13-B03-297591	21800	40	AR-15-FG-016323-01
Caelo	Prilocaine hydro…	15230305	21926	40	20150723

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Prilocaine hydrochloride*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 273 spectra from 7 reference samples of the substance/substance group *Prilocaine hydrochloride*.

- These include spectra of independent samples from 1 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Prilocaine hydrochloride	13I02-N03	21050	40
Fagron	Prilocaine hydrochloride	14H13-B03-297591	21800†	20
Caelo	Prilocaine hydrochloride	15230305	21926†	20
Caelo	Prilocaine hydrochloride	15390101	23250	40
Fagron	Prilocaine hydrochloride	14H13-B03-297591	21800SI	60
Caelo	Prilocaine hydrochloride	15230305	21926SI	60
Caelo	Prilocaine hydrochloride	15390101	23250SI	33

- 161 800 spectra from a total of 3495 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B*

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 4 spectra from 4 *Apo-Ident* customers from 4 batches from the substance/substance group *Prilocaine hydrochloride*.

- These include spectra of independent samples from 4 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
GEHE 02.05.2013	Prilocaine hydrochloride		1
Fagron	Prilocaine hydrochloride	13I032-N03	1
Caelo	Prilocaine hydrochloride	14A03-B34-290281	1
Fargon	Prilocaine hydrochloride	17H02-B05	1

- 77 155 spectra from 463 *Apo-Ident* customers from a total of 25 543 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Prilocaine hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Prilocaine hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	246	27	161 800
Type C	0	4	0	77 155

The substance/substance group *Prilocaine hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	90.1099 % (> 89.0110 %)
Type C	100.0000 % (> 99.8853 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to

exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21048	21048	0.00	45.32
21800	21800	0.00	45.24
21926	21800	8.38	44.01

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Procaine hydrochloride**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20042-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Procaine hydrochloride; Procaini hydrochloridum; Procainum hydrochloricum

Special notes

When selecting the *Procaine hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Procaine hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Procaine hydroch…	13109906	21785	40	AR-15-FG-008935-01
Caelo	Procaine hydroch…	15006906	22247	40	20150209
Fagron	Procaine hydroch…	13F12-B40-301798	22260	40	20141210
Euro OTC	Procaine hydroch…	1601014	22306	40	20160203*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 4 reference samples from the substance/substance group *Procaine hydrochloride*. These samples are listed above in the section *calibration samples*. The reference samples originate from 4 different batches.

- 72 273 spectra from a total of 1578 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 270 spectra from 9 reference samples of the substance/substance group *Procaine hydrochloride*.

- These include spectra of independent samples from 5 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Procaine hydrochloride	08L11-N12	20042	30
Euro OTC	Procaine hydrochloride	1003001-01	20542	40
Caelo	Procaine hydrochloride	13109906	21785†	20
Caelo	Procaine hydrochloride	15006906	22247†	20
Fagron	Procaine hydrochloride	13F12-B40-301798	22260†	20
Euro OTC	Procaine hydrochloride	1601014	22306†	20
Caelo	Procaine hydrochloride	161378	22624	40
Fagron	Procaine hydrochloride	15J27-B10-322937	23379	40
Caelo	Procaine hydrochloride	171675	23634	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 803 spectra from a total of 3490 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 94 spectra from 57 *Apo-Ident* customers from 54 batches from the substance/substance group *Procaine hydrochloride*.

- These include spectra of independent samples from 52 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Euro OTC	Procaine hydrochloride	1104012-04	5
Euro OTC	Procaine hydrochloride	1104012-05	5
Caelo	Procaine hydrochloride	7011506	1
Alliance Health 09.09.2...	Procaine hydrochloride	1104012-05	1
Caelo	Procaine hydrochloride	13/09-N08	1
Fagron	Procaine hydrochloride	13/30-N06	1
Fagron	Procaine hydrochloride	13I09-N08	1
Noweda	Procaine hydrochloride	1309N08	1
Caelo	Procaine hydrochloride	1310880	1
Caelo	Procaine hydrochloride	13109905	1
Caelo	Procaine hydrochloride	13109906	2
Caelo	Procaine hydrochloride	13109916	2
Fagron	Procaine hydrochloride	13F12-B40	1
Caelo	Procaine hydrochloride	13F12-B40-302510	1
Euro OTC	Procaine hydrochloride	1405027-01	5
Euro OTC	Procaine hydrochloride	1405027-02	1
Caelo	Procaine hydrochloride	14164409	3
Caelo	Procaine hydrochloride	14164408	1
Caesar & Loretz GmbH	Procaine hydrochloride	14164413	1
Caelo	Procaine hydrochloride	14164413	1
Caelo	Procaine hydrochloride	15006902	1
Caelo	Procaine hydrochloride	15006906	2
Fagron	Procaine hydrochloride	15006906	1
Caesar & Loretz GmbH	Procaine hydrochloride	15006907	1
Caelo	Procaine hydrochloride	15006913	1
Caelo	Procaine hydrochloride	15006912	1
Euro OTC	Procaine hydrochloride	1601014-01	5
Caelo	Procaine hydrochloride	16137812	2
siehe WE-Prüfprotokoll	Procaine hydrochloride	39/12	1
Gatt-Koller / Phoenix	Procaine hydrochloride	4428/10122714	2
Euro OTC	Procaine hydrochloride	5127	1
Caelo	Procaine hydrochloride	60998127	2
Phönix Gotha	Procaine hydrochloride	190311	1
Euro OTC	Procaine hydrochloride	1003001-01	1
Kehr	Procaine hydrochloride	10159721	1
Caelo	Procaine hydrochloride	10159721	1
Caelo	Procaine hydrochloride	10159723	1
Caelo	Procaine hydrochloride	10159729	1

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Supplier	Substance	Batch	Spectra
Gehe	Procaine hydrochloride	10159730	1
Fagron	Procaine hydrochloride	10H11-N25	1
Euro OTC	Procaine hydrochloride	1104012-01	1
Euro OTC	Procaine hydrochloride	1104012-03	4
Phönix 08.01.2014	Procaine hydrochloride	1104012-03	1
Gehe	Procaine hydrochloride	1104012-03	1
Caelo	Procaine hydrochloride	11370204	1
Caelo	Procaine hydrochloride	11370206	1
Caelo	Procaine hydrochloride	11370203	1
Caelo	Procaine hydrochloride	11370216	2
Caelo	Procaine hydrochloride	11370215	1
Caelo	Procaine hydrochloride	11370219	1
Koisser	Procaine hydrochloride	11370218	1
Caelo	Procaine hydrochloride	12177801	3
Herstellung	Procaine hydrochloride	12177801	1
Fagron	Procaine hydrochloride	12I10-N07	2
Caelo	Procaine hydrochloride	13109908	2
China Medica	Procaine hydrochloride	13109911	1
Caelo	Procaine hydrochloride	13109915	1
Caelo	Procaine hydrochloride	131099903	1
Fagron	Procaine hydrochloride	1651212	1
Caelo	Procaine hydrochloride	13I09-N08	1
Euro OTC	Procaine hydrochloride	200644	1
Anzag	Procaine hydrochloride	60998058	1

- 77 065 spectra from 463 *Apo-Ident* customers from a total of 25 493 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Procaine hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Procaine hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	160	0	72 273
Type B	0	270	0	161 803
Type C	0	91	3	77 065

The substance/substance group *Procaine hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 97.7778 %)
Type C	100.0000 % (> 99.8850 %)	96.8085 % (> 93.6170 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several

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new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21785	21785	0.00	39.01
22247	21785	5.56	41.26
22260	21785	4.88	41.24
22306	22306	0.00	38.19

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Progesterone, micronized**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20024-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Progesterone, micronized; Progesteronum micronisatum

Special notes

When selecting the *Progesterone, micronized* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Progesterone, micronized*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Progesterone, mi…	1111053-01	20718	30	20120119
Euro OTC	Progesterone, mi…	1506033	21868	20	0000010482
Euro OTC	Progesterone, mi…	1506034	21870	40	0000010483
Euro OTC	Progesterone, mi…	1509008	21907	40	20150914*
Euro OTC	Progesterone, mi…	1511008	22226	40	20151119*

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Progesterone, mi…	1601009	22301	30	20160128*
Euro OTC	Progesterone, mi…	1601001	22303	30	20160128*
Euro OTC	Progesterone, mi…	1603004	22525	40	20160406*
Fagron	Progesterone, mi…	16A20-B02-319103	22830	40	20160209
Caelo	Progesterone, mi…	15319601	22831	40	20151014
Euro OTC	Progesterone, mi…	1506033	21868SI	20	0000010482
Euro OTC	Progesterone, mi…	1601009	22301SI	30	20160128*
Fagron	Progesterone, mi…	16A20-B02-319103	22830SI	40	20160209

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 440 spectra of 13 reference samples from the substance/substance group *Progesterone, micronized*. These samples are listed above in the section *calibration samples*. The reference samples originate from 10 different batches.

- 71 993 spectra from a total of 1572 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 1704 spectra from 51 reference samples of the substance/substance group *Progesterone, micronized*.

- These include spectra of independent samples from 19 batches, of which no spectra have been used for the generation of the database.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Progesterone, micronized	71498458	20024	60
Fagron	Progesterone, micronized	12A19-N04	20546	40
Caelo	Progesterone, micronized	080277304	21018	30
Euro OTC	Progesterone, micronized	1506033	21868†	40
Euro OTC	Progesterone, micronized	1506034	21870†	20
Euro OTC	Progesterone, micronized	1509008	21907†	20
Euro OTC	Progesterone, micronized	1511008	22226†	20
Euro OTC	Progesterone, micronized	1601009	22301†	15
Euro OTC	Progesterone, micronized	1601001	22303†	15
Euro OTC	Progesterone, micronized	1603012	22529	40
Euro OTC	Progesterone, micronized	1605013	22556	40
Euro OTC	Progesterone, micronized	1606033	22704	40
Euro OTC	Progesterone, micronized	1605032	22705	40
Euro OTC	Progesterone, micronized	1609016	22788	40
Euro OTC	Progesterone, micronized	1609001	22819	40
Euro OTC	Progesterone, micronized	1701038	23138	40
Euro OTC	Progesterone, micronized	1702026	23148	40
Caelo	Progesterone, micronized	17060903	23249	40
Caelo	Progesterone, micronized	170609	23329	40
Euro OTC	Progesterone, micronized	1707012	23536	40
Euro OTC	Progesterone, micronized	1705028	23541	40
Euro OTC	Progesterone, micronized	1709012	23732	40
Caelo	Progesterone, micronized	172778	23838	40
Caelo	Progesterone, micronized	170609	23844	40
Euro OTC	Progesterone, micronized	1801036	23947	40
Euro OTC	Progesterone, micronized	1802030	24067	40
Euro OTC	Progesterone, micronized	1506033	21868SI†	30
Euro OTC	Progesterone, micronized	1506034	21870SI	59
Euro OTC	Progesterone, micronized	1509008	21907SI	53
Euro OTC	Progesterone, micronized	1511008	22226SI	27
Euro OTC	Progesterone, micronized	1601009	22301SI†	15
Euro OTC	Progesterone, micronized	1601001	22303SI	44
Euro OTC	Progesterone, micronized	1603004	22525SI	31
Euro OTC	Progesterone, micronized	1603012	22529SI	29
Euro OTC	Progesterone, micronized	1605013	22556SI	30
Euro OTC	Progesterone, micronized	1606033	22704SI	30
Euro OTC	Progesterone, micronized	1605032	22705SI	38
Euro OTC	Progesterone, micronized	1609016	22788SI	30
Euro OTC	Progesterone, micronized	1609001	22819SI	30
Caelo	Progesterone, micronized	15319601	22831SI	40
Euro OTC	Progesterone, micronized	1701038	23138SI	20
Euro OTC	Progesterone, micronized	1702026	23148SI	20
Caelo	Progesterone, micronized	17060903	23249SI	20
Caelo	Progesterone, micronized	170609	23329SI	20
Euro OTC	Progesterone, micronized	1707012	23536SI	28
Euro OTC	Progesterone, micronized	1705028	23541SI	25
Euro OTC	Progesterone, micronized	1709012	23732SI	40
Caelo	Progesterone, micronized	172778	23838SI	30
Caelo	Progesterone, micronized	170609	23844SI	23
Euro OTC	Progesterone, micronized	1801036	23947SI	20
Euro OTC	Progesterone, micronized	1802030	24067SI	32

- 160 369 spectra from a total of 3472 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 538 spectra from 157 *Apo-Ident* customers from 216 batches from the substance/substance group *Progesterone, micronized*.

- These include spectra of independent samples from 211 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Progesterone, micronized	7101401	1
Caelo	Progesterone, micronized	12195828	1
Caesar/Noweda	Progesterone, micronized	12195912	1
Caelo	Progesterone, micronized	12195924	4
Caelo	Progesterone, micronized	12195905	3
Euro OTC	Progesterone, micronized	12195924	1
Caelo	Progesterone, micronized	12195926	20
Caelo	Progesterone, micronized	12195928	10
keine Angabe	Progesterone, micronized	1304040-01	1
Fagron	Progesterone, micronized	12A19-N04	4
Euro OTC	Progesterone, micronized	1304040-02	3
Changzhou Jiaerke Pharma	Progesterone, micronized	1308015-01	1
Euro OTC	Progesterone, micronized	1308015-01	3
Vdl 28.04.14;Preis 39,95	Progesterone, micronized		1
Caelo	Progesterone, micronized	13155902	10
Caelo	Progesterone, micronized	13155920	1
Phönix	Progesterone, micronized	13155920	1
Caesar u Loretz	Progesterone, micronized	13155920	1
Caelo	Progesterone, micronized	13155921	2
VDL;07.11.14;39,95 euro	Progesterone, micronized	13155921	1
Caelo	Progesterone, micronized	13155927	3
Caelo	Progesterone, micronized	13155928	3
Caelo	Progesterone, micronized	13155929	3
PHOENIX am 18.03.2014	Progesterone, micronized	13A02-N01	1
Caelo	Progesterone, micronized	13G11-N02	1
Phoenix 28.03.2014	Progesterone, micronized	13G11-N02	1
Fagron	Progesterone, micronized	13H01-N03	9
Fagron	Progesterone, micronized	13G11-N02	11
Fagron	Progesterone, micronized	13h01-n03	1
Phoenix 09.12.14	Progesterone, micronized	13H01-N03	1
Caelo	Progesterone, micronized	13HI01-N03	1
Anzag	Progesterone, micronized	13K28-B01-293478	1
Fagron	Progesterone, micronized	13K28-B30-288261	2
Fagron	Progesterone, micronized	13K28-B30-288262	2
Fagron	Progesterone, micronized	13k28-b30-288262	1
Fagron	Progesterone, micronized	13K28-B30-288263	1
Euro OTC	Progesterone, micronized	1401002-01	7
Caelo	Progesterone, micronized	140100201	1
EuRho	Progesterone, micronized	1401002-01	2
Dorfmeister	Progesterone, micronized	140301-01	1
Euro OTC	Progesterone, micronized	1403019-01	3
Euro OTC	Progesterone, micronized	1406022-01	1
Euro OTC	Progesterone, micronized	140602201	1

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Supplier	Substance	Batch	Spectra
Europh-Jenne	Progesterone, micronized	1406022-01	1
Euro OTC	Progesterone, micronized	1406910-01	1
Euro OTC	Progesterone, micronized	1406022-02	2
Euro OTC	Progesterone, micronized	140602202	1
Euro OTC	Progesterone, micronized	1409010-01	1
Euro OTC	Progesterone, micronized	1409019-01	1
Euro OTC	Progesterone, micronized	140901001	1
Euro OTC	Progesterone, micronized	1409029-01	3
Euro OTC	Progesterone, micronized	140910-01	1
Euro OTC	Progesterone, micronized	1411043-01	5
Euro OTC	Progesterone, micronized	141104301	1
Caelo	Progesterone, micronized	14253906	4
	Progesterone, micronized	14253906	1
Caelo	Progesterone, micronized	14253911	5
Caelo	Progesterone, micronized	14253915	2
Caelo	Progesterone, micronized	14253929	2
Fagron	Progesterone, micronized	14C10-B01	2
Fagron	Progesterone, micronized	14c10-B01-293478	1
Fagron	Progesterone, micronized	14c10-b01-293478	1
Sanacorp	Progesterone, micronized	14C10-B01-293478	1
Fagron	Progesterone, micronized	14D22-B04	2
Fagron	Progesterone, micronized	14D22-B04-293477	2
Fagron	Progesterone, micronized	14D22-B04-293476	1
Fagron	Progesterone, micronized	14D22-B293479	1
Fagron	Progesterone, micronized	14D22-Bo4	1
Fagron	Progesterone, micronized	14G01-B06	1
Caelo	Progesterone, micronized	14H13-B05-3002016	1
Fagron	Progesterone, micronized	14H13-B05-300216	3
Fagron	Progesterone, micronized	14K11-B04	3
Fagron	Progesterone, micronized	14k11-b04	1
Fagron	Progesterone, micronized	14K11-B04300921	1
Fagron	Progesterone, micronized	14K11-B04-300920	6
Caelo	Progesterone, micronized	14K11-B04-300920	1
Anzag	Progesterone, micronized	14k11-b04-300921	1
Fagron	Progesterone, micronized	14K11-B04-300921	1
Fagron	Progesterone, micronized	14K11-B04-300922	1
Fagron	Progesterone, micronized	14K11-B04-300923	1
Fagron	Progesterone, micronized	14L15-B05-302292	2
allianz	Progesterone, micronized	15/11-B05-315224	3
Fagron	Progesterone, micronized	15/11-B05-315224	1
Fagron	Progesterone, micronized	14O22-B04-293476	1
Euro OTC	Progesterone, micronized	1502030-01	2
Euro OTC	Progesterone, micronized	1503012-01	5
Euro OTC	Progesterone, micronized	1506033-01	9
Euro OTC	Progesterone, micronized	1509008-01	6
Euro OTC	Progesterone, micronized	150900801	1
Euro OTC	Progesterone, micronized	1509008-02	1
Caelo	Progesterone, micronized	1511-B05-313598	1
Caelo	Progesterone, micronized	15124910	2
sanacorp	Progesterone, micronized	15124902	1
Caelo	Progesterone, micronized	15124902	1
Caelo	Progesterone, micronized	15124919	2
Caesar u Loretz	Progesterone, micronized	15124919	1
Caelo	Progesterone, micronized	15319601	4
Caelo	Progesterone, micronized	15319602	2
Phönix	Progesterone, micronized	15319604	1
Sanacorp, 16.08.2016, 4...	Progesterone, micronized	15319607	1
Caelo	Progesterone, micronized	15319607	2
Caelo	Progesterone, micronized	15319618	4
Fagron	Progesterone, micronized	15C31-B06	2

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Supplier	Substance	Batch	Spectra
Fagron	Progesterone, micronized	15B12-B04-304838	1
Fagron	Progesterone, micronized	15B12-Bo4-304838	1
Caelo	Progesterone, micronized	15319619	1
Fagron	Progesterone, micronized	15C31-B06-308439	2
Fagron	Progesterone, micronized	15C31B06308439	1
Fagron	Progesterone, micronized	15C31-B06-308796	4
Fagron	Progesterone, micronized	15C31-B06-309790	2
Caelo	Progesterone, micronized	15C31-B06-312963	3
Ebert u. Jacobi 16.0...	Progesterone, micronized	15C31-B06-312963	1
Fagron	Progesterone, micronized	15C31-B06-312963	1
Fagron	Progesterone, micronized	15C31-B06-313599	1
Fagron	Progesterone, micronized	15C31-B06-316105	3
Fagron	Progesterone, micronized	15C31-Bo6-308796	1
Fagron	Progesterone, micronized	15I11-B05-313598	1
Caelo	Progesterone, micronized	15I11-B05-314184	2
Fagron	Progesterone, micronized	15I11-B05-314184	4
Alliance	Progesterone, micronized	15i11-b05-315224	1
Fagron	Progesterone, micronized	15I11-B05-314842	1
Alliance	Progesterone, micronized	15I11-B05-315224	2
Fagron	Progesterone, micronized	15I11-B05-315224	1
Euro OTC	Progesterone, micronized	1601009-01	5
Caelo	Progesterone, micronized	160100902	1
Euro OTC	Progesterone, micronized	1601009-02	3
Euro OTC	Progesterone, micronized	1605013-01	3
Phönix	Progesterone, micronized	1605013-01	1
Euro OTC	Progesterone, micronized	1605013-02	7
Caelo	Progesterone, micronized	16103601	2
Caelo	Progesterone, micronized	16103602	3
Caelo	Progesterone, micronized	16103606	1
Caelo	Progesterone, micronized	16103605	1
Caelo	Progesterone, micronized	16103610	4
Caelo	Progesterone, micronized	16103607	1
Cealo/Noweda	Progesterone, micronized	16103607	1
Fagron	Progesterone, micronized	16A20-B02-318667	3
Fagron	Progesterone, micronized	16A20-B02-321373	1
Caelo	Progesterone, micronized	16A20-B02-319103	1
Fagron	Progesterone, micronized	16A20-B02-321374	4
Fagron	Progesterone, micronized	16a20-b02-321375	1
Fagron	Progesterone, micronized	16A20-B02-321375	2
Fagron	Progesterone, micronized	16g115-b04-325136	1
Fagron	Progesterone, micronized	16g15-b04	1
Fagron	Progesterone, micronized	16G15-B04	1
Fagron	Progesterone, micronized	16G15-B04-325135	1
Fagron	Progesterone, micronized	16G15-B04325136	1
Fagron	Progesterone, micronized	16G15-B04-325136	3
Fagron	Progesterone, micronized	16G15-B04-325279	1
Fagron	Progesterone, micronized	16G15-B04-32579	1
Fagron	Progesterone, micronized	16G15-B04-326487	2
Ebert-Jacobi	Progesterone, micronized	16J05-B04-328263	1
phönix	Progesterone, micronized	16g15-b04-326487	1
Fagron	Progesterone, micronized	16L29-B03	1
Caelo	Progesterone, micronized	16L29-B03-330995	1
Fagron	Progesterone, micronized	16L29-B03-330995	1
Fagron	Progesterone, micronized	16L29-B-332061	1
Caelo	Progesterone, micronized	17060903	2
Caelo	Progesterone, micronized	17149903	1
Fagron	Progesterone, micronized	17C15-B03-333672	2
Fagron	Progesterone, micronized	17D25-B06-339655	2
Caelo	Progesterone, micronized	19051502	1
Fagron	Progesterone, micronized	2006500007	1

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Supplier	Substance	Batch	Spectra
Fagron	Progesterone, micronized	200650-0004	2
Anzag	Progesterone, micronized	2515A-03235	1
Fagron	Progesterone, micronized	5013I-03235	1
Euro OTC	Progesterone, micronized	5102	1
Euro OTC	Progesterone, micronized	5104	1
Euro OTC	Progesterone, micronized	7406022-01	1
Audor Pharma	Progesterone, micronized	APC01-120613P	1
Audor Pharma	Progesterone, micronized	APC01-141212P	1
Audor Pharma	Progesterone, micronized	APC01-150311P	1
Audor Pharma	Progesterone, micronized	APC01-150708P	3
Audor Pharma	Progesterone, micronized	APC01-151114P	3
Anzag 07.04.2016	Progesterone, micronized	APC01-150708P	1
Audor Pharma	Progesterone, micronized	APC01-160201P	1
Audor Pharma	Progesterone, micronized	APC01-160201	1
Caelo	Progesterone, micronized	9195408	1
Euro OTC	Progesterone, micronized	11110523-01	1
Euro/ Sanacorp	Progesterone, micronized	C01-131116(M)	1
Caelo	Progesterone, micronized	HTT140302	1
Caelo	Progesterone, micronized	B03333671	1
Fagron	Progesterone, micronized	HTT140302	1
Gehe	Progesterone, micronized	1111053-01	4
Euro OTC	Progesterone, micronized	1111053-01	10
Caelo	Progesterone, micronized	12A19-N04	2
A.H. 03.06.13 ek: 6,50EUR	Progesterone, micronized	1304014-01	1
Fagron	Progesterone, micronized	1-111218	1
Fagron	Progesterone, micronized	1910213235	1
Klenk	Progesterone, micronized	C01-120322	1
Caelo	Progesterone, micronized	9195429	1
Euro OTC	Progesterone, micronized		1
FARGON	Progesterone, micronized	10a21-n18	1
Caelo	Progesterone, micronized	11177207	2
Caelo	Progesterone, micronized	11177219	3
Caelo	Progesterone, micronized	11177221	3
Euro OTC	Progesterone, micronized	1206024-01	2
Alliance Healthcare	Progesterone, micronized	1206024-02	1
Euro OTC	Progesterone, micronized	1211004-01	6
Caelo	Progesterone, micronized	12195902	1
Euro OTC	Progesterone, micronized	12111004-01	1
Caelo	Progesterone, micronized	12195906	4
ANZAG	Progesterone, micronized	12195907	2
Caelo	Progesterone, micronized	12195907	6
Caelo	Progesterone, micronized	12195912	3
Caelo	Progesterone, micronized	12195913	3
Caelo	Progesterone, micronized	12195914	3
Sanacorp	Progesterone, micronized	12195914	1
Caelo	Progesterone, micronized	12195920	10
Phoenix	Progesterone, micronized	12195928	3
Sanacorp	Progesterone, micronized	12195928	1
Fagron	Progesterone, micronized	12a19-n04	1
Fagron	Progesterone, micronized	12D05-N06	5
Fagron	Progesterone, micronized	12G05-N17	10
Fagron	Progesterone, micronized	12K05-N01	2
Fagron	Progesterone, micronized	12K05-N07	2
Fagron	Progesterone, micronized	12k05-n07	1
FARGON	Progesterone, micronized	13/11-n11	1
Fagron	Progesterone, micronized	1311-N11	1
Fagron	Progesterone, micronized	13/11-N11	1
EuRho	Progesterone, micronized	1304040-02	1
Euro OTC	Progesterone, micronized	1304040-01	4
Euro OTC	Progesterone, micronized	130404001	1

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Supplier	Substance	Batch	Spectra
Caelo	Progesterone, micronized	1304040-01	1
Caelo	Progesterone, micronized	130404002	2
Apotärze	Progesterone, micronized	1304040-02	1
Euro OTC	Progesterone, micronized	1304040-2	1
China Medica	Progesterone, micronized	1308015-01	1
Sanacorp	Progesterone, micronized	13155902	1
Synopharm am 10.09.2012	Progesterone, micronized	13A02-N01	1
Caelo	Progesterone, micronized	13A02-N01	3
Fagron	Progesterone, micronized	13A02N01	1
Fagron	Progesterone, micronized	13A02-N01	4
Fragon	Progesterone, micronized	13A02-N02	1
Fagron	Progesterone, micronized	13b08-n01	1
Fagron	Progesterone, micronized	13I11-N11	2
Fagron	Progesterone, micronized	13K-B30-288261	1
Fagron	Progesterone, micronized	13K28-B30-28826	1
Fagron	Progesterone, micronized	14C10B0129347	1
Fagron	Progesterone, micronized	14C10-B01-293478	1
Euro OTC	Progesterone, micronized	1409029-1	1
Euro OTC	Progesterone, micronized	200650	1
fargon	Progesterone, micronized	8577420	1
Caelo	Progesterone, micronized	27121303	1
Audor Pharma	Progesterone, micronized	APC01-120708P	3
Euro OTC	Progesterone, micronized	c01-111218	1
Caelo	Progesterone, micronized	C01-120613	1
Fagron	Progesterone, micronized	C01-120613	1
Fagron	Progesterone, micronized	C01-120322	1
Audor Pharma	Progesterone, micronized	C01-120708P	1
Euro OTC	Progesterone, micronized	C01-130301(M)	2
Euro OTC	Progesterone, micronized	c01-130301	1
Fagron	Progesterone, micronized	C01-130301	1
Euro OTC	Progesterone, micronized	C01-130301M	1
Fagron	Progesterone, micronized	HTT140207	1
Sanacorp	Progesterone, micronized	C01-130504	1
Euro OTC	Progesterone, micronized	co1-111218(M)	1
FARGON	Progesterone, micronized		1
Gehe	Progesterone, micronized	9195429	1
Caelo	Progesterone, micronized	9195419	1
Fagron	Progesterone, micronized	12D05N06	1
Dorfmeister	Progesterone, micronized	1304040-02	1
Sanacorp	Progesterone, micronized	13A02-N01	1
AHD	Progesterone, micronized	13I11-N11	1

- 76 621 spectra from 463 *Apo-Ident* customers from a total of 25 333 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Progesterone, micronized* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Progesterone, micronized* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

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	False positive	True positive	False negative	True negative
Type A	0	440	0	71 993
Type B	0	1704	0	160 369
Type C	0	537	1	76 621

The substance/substance group *Progesterone, micronized* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9887 %)	100.0000 % (> 98.6364 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 99.6479 %)
Type C	100.0000 % (> 99.8849 %)	99.8141 % (> 99.2565 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20718	21907	4.65	21.06
21868	21868	0.00	16.01
21870	21870	0.00	19.93
21907	21907	0.00	21.98
22226	22226	0.00	20.90
22301	22301	0.00	21.04
22303	22303	0.00	18.97
22525	22525	0.00	28.66
22830	22301	2.81	25.83
22831	21907	2.91	23.84

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Promethazine hydrochloride**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20208-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Promethazine hydrochloride; Promethazini hydrochloridum; Promethazinum hydrochloricum

Special notes

When selecting the *Promethazine hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Promethazine hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Promethazine hyd…	13119214	21690	40	20130506
Caelo	Promethazine hyd…	161466	22628	40	20160621*
Caelo	Promethazine hyd…	17058601	23248	40	20170310

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Promethazine hydrochloride*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 100 spectra from 3 reference samples of the substance/substance group *Promethazine hydrochloride*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Promethazine hydrochloride	10334401	20208	40
Caelo	Promethazine hydrochloride	13119214	21690†	20
Caelo	Promethazine hydrochloride	170586	23324	40

- 161 973 spectra from a total of 3496 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 4 spectra from 3 *Apo-Ident* customers from 4 batches from the substance/substance group *Promethazine hydrochloride*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Promethazine hydrochloride	14336505	1
Caelo	Promethazine hydrochloride	17058601	1
Caelo	Promethazine hydrochloride	13119211	1
Caelo	Promethazine hydrochloride	11352305	1

- 77 155 spectra from 463 *Apo-Ident* customers from a total of 25 543 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Promethazine hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Promethazine hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	100	0	161 973
Type C	0	4	0	77 155

The substance/substance group *Promethazine hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 94.0000 %)
Type C	100.0000 % (> 99.8853 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21690	22628	7.99	58.52
22628	22628	0.00	63.31
23248	22628	6.01	59.16

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Propranolol hydrochloride**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20954-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Propranolol hydrochloride; Propranololi hydrochloridum; Propranololum hydrochloricum

Special notes

When selecting the *Propranolol hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Propranolol hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Propranolol hydr…	13I13-N04	20954	40	1402307
Caelo	Propranolol hydr…	12370712	21396	40	20130116
Caelo	Propranolol hydr…	12370712	21410	40	20130116
Fagron	Propranolol hydr…	15F16-B02-312979	22591	40	20150630

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 4 reference samples from the substance/substance group *Propranolol hydrochloride*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 273 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 201 spectra from 6 reference samples of the substance/substance group *Propranolol hydrochloride*.

- These include spectra of independent samples from 4 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Propranolol hydrochloride	10C15-N15	20253	41
Caelo	Propranolol hydrochloride	12370712	21396†	20
Caelo	Propranolol hydrochloride	12370712	21410†	20
Caelo	Propranolol hydrochloride	15283302	22590	40
Caelo	Propranolol hydrochloride	171722	23650	40
Caelo	Propranolol hydrochloride	173330	23836	40

- 161 872 spectra from a total of 3494 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 236 spectra from 132 *Apo-Ident* customers from 81 batches from the substance/substance group *Propranolol hydrochloride*.

- These include spectra of independent samples from 76 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Propranolol hydrochloride	12K06-N07	9
Fagron	Propranolol hydrochloride	4071401	1
Caelo	Propranolol hydrochloride	5283301	1
Fagron	Propranolol hydrochloride	11D01-N11	1
Caelo	Propranolol hydrochloride	12370709	2
Caelo	Propranolol hydrochloride	12370710	2
Sanacorp	Propranolol hydrochloride	12370712	1
Caelo	Propranolol hydrochloride	12370712	1
Caelo	Propranolol hydrochloride	13/13-N04	4
Fagron	Propranolol hydrochloride	13I13-N04	8
Fagron	Propranolol hydrochloride	1313-N04	2
Fagron	Propranolol hydrochloride		1
Caelo	Propranolol hydrochloride	13379804	1
Euro OTC	Propranolol hydrochloride	13379806	1
Caelo	Propranolol hydrochloride	13379806	1
Caelo	Propranolol hydrochloride	13379807	5
Caesar u Loretz	Propranolol hydrochloride	13379807	1
Caelo	Propranolol hydrochloride	13379809	4
Fagron	Propranolol hydrochloride	13E13-B40-289355	1
Caelo	Propranolol hydrochloride	13E15-B40	3
Fagron	Propranolol hydrochloride	13E15B40-297021	1
Fagron	Propranolol hydrochloride	13E15-B40	6
Fagron	Propranolol hydrochloride	13E15-B40-289355	10
Caelo	Propranolol hydrochloride	13E15-B40-289355	3
Fagron	Propranolol hydrochloride	13E15-B40-294297	6
Alliance health	Propranolol hydrochloride	13E15-B40-294297	1
Fagron	Propranolol hydrochloride	13E15-B40-297021	4
Caelo	Propranolol hydrochloride	13I13N04	1
Gutenberg-Apotheke	Propranolol hydrochloride	13I13-N04	1
Euro OTC	Propranolol hydrochloride	13I13-N04	1
Fagron	Propranolol hydrochloride	13J13-N04	3
Fagron	Propranolol hydrochloride	13l13-N04	1
Gehe Kassel 26.06.2015	Propranolol hydrochloride	15082401	1
Caelo	Propranolol hydrochloride	15082401	8
Calo/AHD	Propranolol hydrochloride	15082401	1
Caelo	Propranolol hydrochloride	15082405	3
Caelo	Propranolol hydrochloride	15283301	11
Caelo	Propranolol hydrochloride	15283302	5
allianz	Propranolol hydrochloride	15283302	1
Caeo/Noweda	Propranolol hydrochloride	15283302	1
Caelo	Propranolol hydrochloride	15422501	6
Caelo	Propranolol hydrochloride	15422502	9
Caelo	Propranolol hydrochloride	15422505	6

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Supplier	Substance	Batch	Spectra
/O. Geilenkirchen	Propranolol hydrochloride	15422502	1
Caelo	Propranolol hydrochloride	15F16-B02	1
Fagron	Propranolol hydrochloride	15F16-B02	1
Changzhou Yabang Pharma…	Propranolol hydrochloride	15F16-B02	1
Caelo	Propranolol hydrochloride	15F16-B02-312979	3
Fagron	Propranolol hydrochloride	15F16B02312979	1
Fagron	Propranolol hydrochloride	15F16-B02-312979	3
Fagron	Propranolol hydrochloride	15K11-B01-316401	7
Fagron	Propranolol hydrochloride	15K11-B01	1
Caelo	Propranolol hydrochloride	15K11-B01-316401	1
Noweda/Apomix	Propranolol hydrochloride	15K11-B01-316401	1
Fagron	Propranolol hydrochloride	15K11-B01-320607	3
Caelo	Propranolol hydrochloride	16138302	2
Fagron	Propranolol hydrochloride	15K11-B01-322717	1
Phönix	Propranolol hydrochloride	15k11-b01-322717	1
Sanacorp	Propranolol hydrochloride	16138304	1
Caelo	Propranolol hydrochloride	16138304	1
Caelo	Propranolol hydrochloride	16238302	1
phönix	Propranolol hydrochloride	16e09-b09	1
Caelo	Propranolol hydrochloride	16E09-B09-326637	1
Fagron	Propranolol hydrochloride	16E09-B09-330547	1
Fagron	Propranolol hydrochloride	16E09-B09-326637	1
phönix	Propranolol hydrochloride	16e09b09326637	1
Caelo	Propranolol hydrochloride	17172203	1
Caelo	Propranolol hydrochloride	17172204	3
Fagron	Propranolol hydrochloride	28051508	1
Inresa 22.09.15	Propranolol hydrochloride	3043PRRII	1
phönix	Propranolol hydrochloride	2/AKD3	1
Fagron	Propranolol hydrochloride	3050PRII	1
Fagron	Propranolol hydrochloride	3112U-03609	1
Fagron	Propranolol hydrochloride	3913M-03609	1
Fagron	Propranolol hydrochloride	5101	1
Fagron	Propranolol hydrochloride	700556-0001	1
Caelo	Propranolol hydrochloride	M130104	1
Fagron	Propranolol hydrochloride	M130104	2
Caelo	Propranolol hydrochloride	m130104	1
Löwen City-Apotheke Bar…	Propranolol hydrochloride	4012013	1
Fagron	Propranolol hydrochloride	402310015	1
Fagron	Propranolol hydrochloride	9L09-N06	1
Caelo	Propranolol hydrochloride	11F21-N11	3
Fagron	Propranolol hydrochloride	11I19-N09	1
ANZAG am 10.05.2012	Propranolol hydrochloride	11L01-N05	1
Noweda	Propranolol hydrochloride	11L01-N05	1
Fagron	Propranolol hydrochloride	11L01-N05	2
Caelo	Propranolol hydrochloride	11L01-N05	1
Caelo	Propranolol hydrochloride	12370703	1
Fagron	Propranolol hydrochloride	12A27-N04	1
Fagron	Propranolol hydrochloride	12D27-N14	4
Caelo	Propranolol hydrochloride	12a27-n04	1
Caelo	Propranolol hydrochloride	12D27-N14	2
Fagron	Propranolol hydrochloride	12F29-N06	4
Fagron	Propranolol hydrochloride	12f29-n06	1
Fagron	Propranolol hydrochloride	12F29-N06	1
Fargon	Propranolol hydrochloride	12K06-N07	1
fragon/AHD	Propranolol hydrochloride	13/13-N04	1
Fagron	Propranolol hydrochloride	12K06N07	1
Fagron	Propranolol hydrochloride	13/13-N04	4
Noweda	Propranolol hydrochloride		1
Fagron	Propranolol hydrochloride	20250711-8	1
Fagron	Propranolol hydrochloride	3050PRRII	2

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Supplier	Substance	Batch	Spectra
Fagron	Propranolol hydrochloride	31101201	1
Fagron	Propranolol hydrochloride	9CMK6AA71374	1
Gehe	Propranolol hydrochloride		1
InfectoPharm	Propranolol hydrochloride	J051201	1
InfectoPharm	Propranolol hydrochloride	J0512011	1
Caelo	Propranolol hydrochloride	12370707	1

- 76 923 spectra from 463 *Apo-Ident* customers from a total of 25 466 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Propranolol hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Propranolol hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	72 273
Type B	0	201	0	161 872
Type C	0	201	35	76 923

The substance/substance group *Propranolol hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 97.0149 %)
Type C	100.0000 % (> 99.8850 %)	85.1695 % (> 83.8983 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20954	20954	0.00	53.64
21396	20954	7.49	52.91
21410	20954	4.96	52.93
22591	20954	6.54	52.90

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Propyl-4-hydroxybenzoate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20981-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Propyl-4-hydroxybenzoate; Propylis parahydroxybenzoas; Propylium parahydroxybenzoicum

Special notes

When selecting the *Propyl-4-hydroxybenzoate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Propyl-4-hydroxybenzoate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Propyl-4-hydroxy…	11373523	20981	40	1402440
Caelo	Propyl-4-hydroxy…	13365009	21758	40	20131203
Caelo	Propyl-4-hydroxy…	162595	22754	40	20161005*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Propyl-4-hydroxybenzoate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 152 spectra from 5 reference samples of the substance/substance group *Propyl-4-hydroxybenzoate*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Propyl-4-hydroxybenzoate	10113716	20132	40
Caelo	Propyl-4-hydroxybenzoate	13365009	21758†	20
Caelo	Propyl-4-hydroxybenzoate	162595	22765	40
Caelo	Propyl-4-hydroxybenzoate	171970	23675	40
Caelo	Propyl-4-hydroxybenzoate	14359008	not required	12

- 161 921 spectra from a total of 3494 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 122 spectra from 92 *Apo-Ident* customers from 50 batches from the substance/substance group *Propyl-4-hydroxybenzoate*.

- These include spectra of independent samples from 48 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Propyl-4-hydroxybenzoate	3041408	1
Caelo	Propyl-4-hydroxybenzoate	11373523	3
PHOENIX 10.03.2014	Propyl-4-hydroxybenzoate	11373526	1
Caelo	Propyl-4-hydroxybenzoate	13051504	1
Caelo	Propyl-4-hydroxybenzoate	13100208	1
Gehe 5.3.14	Propyl-4-hydroxybenzoate	13100215	1
Caelo	Propyl-4-hydroxybenzoate	13100215	9
Caesar &Loretz GmbH	Propyl-4-hydroxybenzoate	13100215	1
Caelo	Propyl-4-hydroxybenzoate	13100218	3
Caelo	Propyl-4-hydroxybenzoate	13100217	2
Caelo	Propyl-4-hydroxybenzoate	13100219	1
Caelo	Propyl-4-hydroxybenzoate	13365006	5
Caelo	Propyl-4-hydroxybenzoate	13365009	4
Caelo	Propyl-4-hydroxybenzoate	13365011	6
Caelo	Propyl-4-hydroxybenzoate	13365012	2
Caelo	Propyl-4-hydroxybenzoate	14359005	6
Noweda	Propyl-4-hydroxybenzoate	14359005	1
Caelo	Propyl-4-hydroxybenzoate	14359006	3
Caelo	Propyl-4-hydroxybenzoate	14359008	7
Sanacorp	Propyl-4-hydroxybenzoate	14359008	1
Caelo	Propyl-4-hydroxybenzoate	14359020	3
Caelo	Propyl-4-hydroxybenzoate	14359019	1
Caelo	Propyl-4-hydroxybenzoate	14359009	1
Caelo	Propyl-4-hydroxybenzoate	15246501	1
Caelo	Propyl-4-hydroxybenzoate	15246502	1
Caelo	Propyl-4-hydroxybenzoate	15276514	1
Caelo	Propyl-4-hydroxybenzoate	16259505	2
Caelo	Propyl-4-hydroxybenzoate	16259516	1
Caelo	Propyl-4-hydroxybenzoate	1913I-01931	1
Caelo	Propyl-4-hydroxybenzoate	221014PAS01	1
Caelo	Propyl-4-hydroxybenzoate	3115M-01931	1
Caesar/Noweda	Propyl-4-hydroxybenzoate	3710M-01931	2
Caelo	Propyl-4-hydroxybenzoate	4314U-01931	1
GATT-KOLLER/PHOENIX	Propyl-4-hydroxybenzoate	5080/11130214	1
Fagron	Propyl-4-hydroxybenzoate	610M-01931	1
Caelo	Propyl-4-hydroxybenzoate	1108211931	1
Caelo	Propyl-4-hydroxybenzoate	713Q-01931	1
Sanacorp	Propyl-4-hydroxybenzoate	AKD3	1
siehe WE-Prüfprotokoll	Propyl-4-hydroxybenzoate	84/11	1
Caelo	Propyl-4-hydroxybenzoate	11102609	3
Caelo	Propyl-4-hydroxybenzoate	11102610	1
Caelo	Propyl-4-hydroxybenzoate	11102611	2
Caelo	Propyl-4-hydroxybenzoate	11102621	2
Caelo	Propyl-4-hydroxybenzoate	11102624	3
Caelo	Propyl-4-hydroxybenzoate	11373504	1
Caelo	Propyl-4-hydroxybenzoate	11373505	3

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Supplier	Substance	Batch	Spectra
Noweda	Propyl-4-hydroxybenzoate	11373505	2
Post-Apotheke	Propyl-4-hydroxybenzoate	11373505	1
Anzag	Propyl-4-hydroxybenzoate	11373512	2
Caelo	Propyl-4-hydroxybenzoate	11373512	6
Caelo	Propyl-4-hydroxybenzoate	11373518	3
Caelo	Propyl-4-hydroxybenzoate	113735223	1
Herbasinica	Propyl-4-hydroxybenzoate	11373523	1
AHD	Propyl-4-hydroxybenzoate	11373523	1
Caelo	Propyl-4-hydroxybenzoate	11373524	1
Phönix 14.01.2014	Propyl-4-hydroxybenzoate	11373526	1
Fagron	Propyl-4-hydroxybenzoate	12B13-N04	1
Phoenix	Propyl-4-hydroxybenzoate	13100215	1
Euro OTC	Propyl-4-hydroxybenzoate	2509025	1
Caelo	Propyl-4-hydroxybenzoate	290114PML03	1
Caelo	Propyl-4-hydroxybenzoate	82792159	1
Sanacorp, 12.08.2016, 4…	Propyl-4-hydroxybenzoate	14359005	1

- 77 037 spectra from 463 *Apo-Ident* customers from a total of 25 499 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Propyl-4-hydroxybenzoate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Propyl-4-hydroxybenzoate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	142	10	161 921
Type C	0	90	32	77 037

The substance/substance group *Propyl-4-hydroxybenzoate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	93.4211 % (> 91.4474 %)
Type C	100.0000 % (> 99.8850 %)	73.7705 % (> 71.3115 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

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Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20981	20981	0.00	23.50
21758	20981	5.05	21.69
22754	22754	0.00	18.81

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Propyphenazone**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20805-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Propyphenazone; Propyphenazonum; Propyphenazonum plv.

Special notes

When selecting the *Propyphenazone* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Propyphenazone*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Propyphenazone	12039103	20805	40	1402051
Caelo	Propyphenazone	13332206	21454	40	20131009
Fagron	Propyphenazone	16E02-B08-327928	23261	40	20160602
Fagron	Propyphenazone	16H25-B01-334972	23922	40	20161227

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 4 reference samples from the substance/substance group *Propyphenazone*. These samples are listed above in the section *calibration samples*. The reference samples originate from 4 different batches.

- 72 273 spectra from a total of 1578 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 140 spectra from 4 reference samples of the substance/substance group *Propyphenazone*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Propyphenazone	09369110	20224	40
Caelo	Propyphenazone	13332206	21454†	20
Caelo	Propyphenazone	15348908	23254	40
Caelo	Propyphenazone	172776	23861	40

- 161 933 spectra from a total of 3495 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 22 spectra from 8 *Apo-Ident* customers from 15 batches from the substance/substance group *Propyphenazone*.

- These include spectra of independent samples from 14 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Raben-Apotheke Mildenau	Propyphenazone	12039103	1
Caelo	Propyphenazone	13036702	4
Fagron	Propyphenazone	13B12-B02-297171	1
Gatt-Koller / Phoenix	Propyphenazone	419/02123112	1
Caelo	Propyphenazone	12039101	2
Fargon	Propyphenazone	11H31-N07	1
Caelo	Propyphenazone	12039112	1
Euro OTC	Propyphenazone		1
Caelo	Propyphenazone	13137104	1
Caelo	Propyphenazone	13332205	3
Fagron	Propyphenazone	13K20-B03-311715	1
Caelo	Propyphenazone	15122502	1
Caelo	Propyphenazone	15122505	1
Caelo	Propyphenazone	15348902	1
Caelo	Propyphenazone	15122504	1
Caelo	Propyphenazone	12039103	1

- 77 137 spectra from 463 *Apo-Ident* customers from a total of 25 532 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Propyphenazone* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Propyphenazone* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	72 273
Type B	0	140	0	161 933
Type C	0	20	2	77 137

The substance/substance group *Propyphenazone* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 95.7143 %)
Type C	100.0000 % (> 99.8850 %)	90.9091 % (> 77.2727 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20805	20805	0.00	41.48
21454	20805	7.83	41.87
23261	20805	5.95	40.07
23922	20805	10.29	39.46

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Pyridoxal-5-phosphate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20830-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Pyridoxal-5-phosphate; Pyridoxali phosphas

Special notes

When selecting the *Pyridoxal-5-phosphate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Pyridoxal-5-phosphate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Pyridoxal-5-phos…	1302029-01	20830	40	8897
Euro OTC	Pyridoxal-5-phos…	1701015	23133	40	20170220*
Euro OTC	Pyridoxal-5-phos…	1711030	23877	40	20171215*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Pyridoxal-5-phosphate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 80 spectra from 2 reference samples of the substance/substance group *Pyridoxal-5-phosphate*.

- These include spectra of independent samples from 1 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Pyridoxal-5-phosphate	1302029-01	21097	40
Euro OTC	Pyridoxal-5-phosphate	1701015-01	23276	40

- 161 993 spectra from a total of 3497 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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- 4 spectra from 4 *Apo-Ident* customers from 4 batches from the substance/substance group *Pyridoxal-5-phosphate*.

- These include spectra of independent samples from 4 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Inresa Arznei	Pyridoxal-5-phosphate	13100411	1
Euro OTC	Pyridoxal-5-phosphate	1408002-01	1
Euro OTC	Pyridoxal-5-phosphate	1701015-01	1
Denk	Pyridoxal-5-phosphate	C041402802	1

- 77 155 spectra from 463 *Apo-Ident* customers from a total of 25 543 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Pyridoxal-5-phosphate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Pyridoxal-5-phosphate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	80	0	161 993
Type C	0	4	0	77 155

The substance/substance group *Pyridoxal-5-phosphate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 92.5000 %)
Type C	100.0000 % (> 99.8853 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20830	20830	0.00	52.31
23133	23133	0.00	50.82
23877	23877	0.00	34.87

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Pyridoxine hydrochloride**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20440-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Pyridoxine hydrochloride; Pyridoxini hydrochloridum; Pyriodoxini hydrochloridum

Special notes

When selecting the *Pyridoxine hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Pyridoxine hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Pyridoxine hydro…	14262302	21675	40	20141002
Euro OTC	Pyridoxine hydro…	1401044-01	21678	40	20140221
Euro OTC	Pyridoxine hydro…	1407009-01	21773	40	20140807
Euro OTC	Pyridoxine hydro…	1507012	21846	40	20150721*
Euro OTC	Pyridoxine hydro…	1601039	22300	40	20160203*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 200 spectra of 5 reference samples from the substance/substance group *Pyridoxine hydrochloride*. These samples are listed above in the section *calibration samples*. The reference samples originate from 5 different batches.

- 72 233 spectra from a total of 1577 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 380 spectra from 12 reference samples of the substance/substance group *Pyridoxine hydrochloride*.

- These include spectra of independent samples from 7 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Pyridoxine hydrochloride	L12010105	20390	40
Fagron	Pyridoxine hydrochloride	09I16-N14	20440	40
Caelo	Pyridoxine hydrochloride	14262302	21675†	20
Euro OTC	Pyridoxine hydrochloride	1401044-01	21678†	20
Euro OTC	Pyridoxine hydrochloride	1407009-01	21773†	20
Euro OTC	Pyridoxine hydrochloride	1507012	21846†	20
Euro OTC	Pyridoxine hydrochloride	1601039	22300†	20
Euro OTC	Pyridoxine hydrochloride	1604063	22569	40
Caelo	Pyridoxine hydrochloride	162225	22770	40
Euro OTC	Pyridoxine hydrochloride	1608035	22798	40
Euro OTC	Pyridoxine hydrochloride	1710014	23735	40
Caelo	Pyridoxine hydrochloride	180287	24024	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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- 161 693 spectra from a total of 3487 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 73 spectra from 15 *Apo-Ident* customers from 33 batches from the substance/substance group *Pyridoxine hydrochloride*.

- These include spectra of independent samples from 31 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Pyridoxine hydrochloride	15218702	6
Caelo	Pyridoxine hydrochloride	15218709	1
Caelo	Pyridoxine hydrochloride	15218710	2
Caelo	Pyridoxine hydrochloride	15218713	3
Caelo	Pyridoxine hydrochloride	16222501	4
Euro OTC	Pyridoxine hydrochloride	1110001-01	1
Caelo	Pyridoxine hydrochloride	12102510	1
Caelo	Pyridoxine hydrochloride	12214119	2
Caelo	Pyridoxine hydrochloride	13102509	2
Caelo	Pyridoxine hydrochloride	13102510	2
Caelo	Pyridoxine hydrochloride	13102516	1
Euro OTC	Pyridoxine hydrochloride	1407009-01	1
Caelo	Pyridoxine hydrochloride	14262302	3
Euro OTC	Pyridoxine hydrochloride	1507012-01	1
Caelo	Pyridoxine hydrochloride	14262306	1
Caelo	Pyridoxine hydrochloride	15218707	1
Euro OTC	Pyridoxine hydrochloride	1601039-01	1
Euro OTC	Pyridoxine hydrochloride	1604063-01	1
Caelo	Pyridoxine hydrochloride	16222514	2
Caelo	Pyridoxine hydrochloride	16222521	1
Fagron	Pyridoxine hydrochloride	9I16-N14	1
Post-Apotheke	Pyridoxine hydrochloride	10026903	1
Caelo	Pyridoxine hydrochloride	11021406	1
Caesar & Loretz GmbH, 4...	Pyridoxine hydrochloride	11197009	5
Caelo	Pyridoxine hydrochloride	11197009	1
Fagron	Pyridoxine hydrochloride	11L19-N06	1
Euro OTC	Pyridoxine hydrochloride	1206022-02	1
Caesar & Loretz GmbH, 4...	Pyridoxine hydrochloride	12214102	5
Caelo	Pyridoxine hydrochloride	12214102	3
Caelo	Pyridoxine hydrochloride	12214104	1
Caelo	Pyridoxine hydrochloride	12214110	2
Caesar & Loretz GmbH, 4...	Pyridoxine hydrochloride	12214110	2
Caesar & Loretz GmbH, 4...	Pyridoxine hydrochloride	12214115	7
Caesar & Loretz GmbH, 4...	Pyridoxine hydrochloride	12214119	2
Fagron	Pyridoxine hydrochloride	12e02-n02	1

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[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Supplier	Substance	Batch	Spectra
Fagron	Pyridoxine hydrochloride	L13080030	1
Euro OTC	Pyridoxine hydrochloride	13D02-N04	1

- 77 086 spectra from 463 *Apo-Ident* customers from a total of 25 514 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Pyridoxine hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Pyridoxine hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	200	0	72 233
Type B	0	364	16	161 693
Type C	0	70	3	77 086

The substance/substance group *Pyridoxine hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9928 %)	95.7895 % (> 95.0000 %)
Type C	100.0000 % (> 99.8850 %)	95.8904 % (> 91.7808 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21675	21846	6.22	68.84
21678	21846	4.19	67.89

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Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21773	21846	1.04	67.22
21846	21846	0.00	67.15
22300	22300	0.00	66.75

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Quinidine sulfate dihydrate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20819-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Quinidine sulfate dihydrate; Chinidini sulfas; Quinidine sulphate dihydrate

Special notes

When selecting the *Quinidine sulfate dihydrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Quinidine sulfate dihydrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Quinidine sulfat…	12L04-N10	20819	40	AR-14-FG-013249-01
Fagron	Quinidine sulfat…	12J16-B03	21217	39	1412323
Fagron	Quinidine sulfat…	14I04-B09-304357	21810	35	AR-15-FG-015409-01

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 114 spectra of 3 reference samples from the substance/substance group *Quinidine sulfate dihydrate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 319 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 175 spectra from 5 reference samples of the substance/substance group *Quinidine sulfate dihydrate*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Quinidine sulfate dihydrate	11J11-N02	20375	40
Fagron	Quinidine sulfate dihydrate	12E25-N03	20582	40
Fagron	Quinidine sulfate dihydrate	12E25-N03	20604	40
Fagron	Quinidine sulfate dihydrate	14I04-B09-304357	21810†	15
Fagron	Quinidine sulfate dihydrate	16A06-B04-324954	22970	40

- 161 898 spectra from a total of 3495 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 1 spectra from 1 *Apo-Ident* customers from 1 batches from the substance/substance group *Quinidine sulfate dihydrate*.

- These include spectra of independent samples from 1 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Quinidine sulfate dihydrate	13G08-N02	1

- 77 158 spectra from 463 *Apo-Ident* customers from a total of 25 546 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Quinidine sulfate dihydrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Quinidine sulfate dihydrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	114	0	72 319
Type B	0	135	40	161 898
Type C	0	1	0	77 158

The substance/substance group *Quinidine sulfate dihydrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 94.7368 %)
Type B	100.0000 % (> 99.9928 %)	77.1429 % (> 75.4286 %)
Type C	100.0000 % (> 99.8862 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20819	20819	0.00	30.31
21217	21217	0.00	28.67
21810	21810	0.00	30.18

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Quinine dihydrochloride**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	23186-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Quinine dihydrochloride; Chinini dihydrochloridum; Chininum dihydrochloricum

Special notes

When selecting the *Quinine dihydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Quinine dihydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Quinine dihydroc…	172129	23636	40	20173008*
Caelo	Quinine dihydroc…	172072	23655	40	20170830*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 80 spectra of 2 reference samples from the substance/substance group *Quinine dihydrochloride*. These samples are listed above in the section *calibration samples*. The reference samples originate from 2 different batches.

- 72 353 spectra from a total of 1580 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 120 spectra from 3 reference samples of the substance/substance group *Quinine dihydrochloride*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Quinine dihydrochloride	16269603	23185	40
Caelo	Quinine dihydrochloride	16269603	23186	40
Caelo	Quinine dihydrochloride	162696	23358	40

- 161 953 spectra from a total of 3497 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 0 spectra from 0 *Apo-Ident* customers from 0 batches from the substance/substance group *Quinine dihydrochloride*.

- These include spectra of independent samples from 0 batches, of which no spectra have been used for the generation of the database.

- 77 159 spectra from 463 *Apo-Ident* customers from a total of 25 547 batches from a further 701 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Quinine dihydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Quinine dihydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	72 353
Type B	0	120	0	161 953
Type C	0	0	0	77 159

The substance/substance group *Quinine dihydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 95.0000 %)
Type C	100.0000 % (> 99.8849 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
23636	23636	0.00	79.23
23655	23655	0.00	78.36

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Quinine hydrochloride**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20547-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Quinine hydrochloride; Chinini hydrochloridum; Chininum hydrochloricum

Special notes

When selecting the *Quinine hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Quinine hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Quinine hydrochl…	13G10-N07	21235	30	20130809
Fagron	Quinine hydrochl…	13I30-B02-295630	21809	40	AR-15-FG-015410-01
Caelo	Quinine hydrochl…	15376201	22309	40	20151105
Caelo	Quinine hydrochl…	16283302	23577	40	1802260

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 150 spectra of 4 reference samples from the substance/substance group *Quinine hydrochloride*. These samples are listed above in the section *calibration samples*. The reference samples originate from 4 different batches.

- 72 283 spectra from a total of 1578 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 200 spectra from 6 reference samples of the substance/substance group *Quinine hydrochloride*.

- These include spectra of independent samples from 4 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Quinine hydrochloride	12C29-N04	20547	40
Fagron	Quinine hydrochloride	13I30-B02-295630	21809†	20
Caelo	Quinine hydrochloride	15376201	22309†	20
Fagron	Quinine hydrochloride	15A20-B03-319027	23573	40
Fagron	Quinine hydrochloride	16K01-B05-340171	23920	40
Caelo	Quinine hydrochloride	180226	24022	40

- 161 873 spectra from a total of 3493 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B*

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 8 spectra from 8 *Apo-Ident* customers from 8 batches from the substance/substance group *Quinine hydrochloride*.

- These include spectra of independent samples from 6 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Quinine hydrochloride	16283302	1
Caelo	Quinine hydrochloride	12316611	1
Fagron	Quinine hydrochloride	10N129B	1
Caelo	Quinine hydrochloride	12316604	1
Caelo	Quinine hydrochloride	13D24-N06	1
Fagron	Quinine hydrochloride	13G10-N07	1
Gatt-Koller	Quinine hydrochloride	3500/08103810	1
Caelo	Quinine hydrochloride	12316605	1

- 77 151 spectra from 463 *Apo-Ident* customers from a total of 25 539 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Quinine hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Quinine hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	150	0	72 283
Type B	0	200	0	161 873
Type C	0	8	0	77 151

The substance/substance group *Quinine hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 97.0000 %)
Type C	100.0000 % (> 99.8851 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several

new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21235	23577	6.00	26.65
21809	21809	0.00	16.00
22309	23577	3.29	20.11
23577	23577	0.00	18.99

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Quinine sulfate dihydrate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	21057-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Quinine sulfate dihydrate; Chinini sulfas; Chininum sulfuricum; Quinine sulphate dihydrate

Special notes

When selecting the *Quinine sulfate dihydrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Quinine sulfate dihydrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Quinine sulfate ...	13J23-N03	21057	40	1404401
Fagron	Quinine sulfate ...	14B27-B01	21277	40	AR-16-FG-009455-01
Caelo	Quinine sulfate ...	13024604	21429	40	AR-16-FG-005472-01

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Quinine sulfate dihydrate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 180 spectra from 5 reference samples of the substance/substance group *Quinine sulfate dihydrate*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Quinine sulfate dihydrate	13024604	21429†	20
Caelo	Quinine sulfate dihydrate	15230005	22959	40
Caelo	Quinine sulfate dihydrate	170616	23281	40
Caelo	Quinine sulfate dihydrate	170616	23316	40
Caelo	Quinine sulfate dihydrate	180630	24032	40

- 161 893 spectra from a total of 3495 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 3 spectra from 2 *Apo-Ident* customers from 3 batches from the substance/substance group *Quinine sulfate dihydrate*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Gatt-Koller / Phoenix	Quinine sulfate dihydrate	`4928/11132214`	1
Caelo	Quinine sulfate dihydrate	`15B06B03304359`	1
Gatt-Koller / Phoenix	Quinine sulfate dihydrate	`2503/07143314`	1

- 77 156 spectra from 463 *Apo-Ident* customers from a total of 25 544 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Quinine sulfate dihydrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Quinine sulfate dihydrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	180	0	161 893
Type C	0	3	0	77 156

The substance/substance group *Quinine sulfate dihydrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 96.6667 %)
Type C	100.0000 % (> 99.8854 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21057	21057	0.00	13.36
21277	21277	0.00	11.10
21429	21429	0.00	15.95

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Quinoline yellow**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20456-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Quinoline yellow

Special notes

When selecting the *Quinoline yellow* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Quinoline yellow*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Quinoline yellow	12E24-N01	20731	40	20120601
Caelo	Quinoline yellow	12042010	20922	40	20120314
Caelo	Quinoline yellow	13109108	21305	40	1711481
Caelo	Quinoline yellow	17034101	23400	40	1709327

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 4 reference samples from the substance/substance group *Quinoline yellow*. These samples are listed above in the section *calibration samples*. The reference samples originate from 4 different batches.

- 72 273 spectra from a total of 1578 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 210 spectra from 6 reference samples of the substance/substance group *Quinoline yellow*.

- These include spectra of independent samples from 4 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Quinoline yellow	11089608	20456	40
Caelo	Quinoline yellow	11089608	20525	40
zu erfassen	Quinoline yellow	zu erfassen	20574	40
Fagron	Quinoline yellow	12E24-N01	20731†	20
Caelo	Quinoline yellow	16050101	23401	40
Caelo	Quinoline yellow	172277	23685	30

- 161 863 spectra from a total of 3495 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B*

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 62 spectra from 42 *Apo-Ident* customers from 38 batches from the substance/substance group *Quinoline yellow*.

- These include spectra of independent samples from 37 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Quinoline yellow	118E-03146	1
Caelo	Quinoline yellow	11089610	2
Caelo	Quinoline yellow	13109102	2
Caelo	Quinoline yellow	14049401	2
Fagron	Quinoline yellow	13C25-N15	2
Caelo	Quinoline yellow	13109106	3
Caelo	Quinoline yellow	13109109	1
Caelo	Quinoline yellow	14274305	1
Caelo	Quinoline yellow	14274309	1
Caelo	Quinoline yellow	14274303	1
Caelo	Quinoline yellow	14363201	1
Caelo	Quinoline yellow	14363202	5
Caelo	Quinoline yellow	14363207	1
Fagron	Quinoline yellow	14D18-B02-295783	1
VDL;23.1.16;6,32EUR	Quinoline yellow	15276801	1
Caelo	Quinoline yellow	15276801	1
Caelo	Quinoline yellow	15276803	2
Caelo	Quinoline yellow	15276804	2
phönix	Quinoline yellow	15276803	1
Caelo	Quinoline yellow	17034102	1
Caelo	Quinoline yellow	16050101	2
sanacorp	Quinoline yellow	3214M-03146	1
Caelo	Quinoline yellow	713E-03146	1
Fagron	Quinoline yellow	100427	1
Caelo	Quinoline yellow	11089601	1
Caelo	Quinoline yellow	11089606	1
anzag am 06.07.2012	Quinoline yellow	11089608	1
Fagron	Quinoline yellow	11F30-N04	1
Noweda	Quinoline yellow	11D13-N01	1
Caelo	Quinoline yellow	12042002	3
Caelo	Quinoline yellow	11089608	1
Fagron	Quinoline yellow	11K08-N01	2
Caelo	Quinoline yellow	12042004	2
Caelo	Quinoline yellow	12042007	4
Fagron	Quinoline yellow	12E24-N05	1
Fagron	Quinoline yellow	12B08-N08	1
PHOENIX	Quinoline yellow	12042004	1
Fagron	Quinoline yellow	12L11-N07	1
Caelo	Quinoline yellow	12042010	1
Caelo	Quinoline yellow	18011305	1
Caelo	Quinoline yellow	20301211-6	1
Fagron	Quinoline yellow	9878	1

- 77 097 spectra from 463 *Apo-Ident* customers from a total of 25 509 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Quinoline yellow* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Quinoline yellow* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	121	39	72 273
Type B	0	110	100	161 863
Type C	0	42	20	77 097

The substance/substance group *Quinoline yellow* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	75.6250 % (> 73.7500 %)
Type B	100.0000 % (> 99.9928 %)	52.3810 % (> 50.9524 %)
Type C	100.0000 % (> 99.8850 %)	67.7419 % (> 62.9032 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20731	21305	29.33	73.87
20922	21305	4.91	85.66
21305	21305	0.00	89.32
23400	23400	0.00	70.85

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Quinolinol sulfate potassium sulfate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20573-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Quinolinol sulfate potassium sulfate; Chinolini et kalii sulfas; Kalii oxychinolinum sulfuricum; Quinolinol sulphate potassium sulphate

Special notes

When selecting the *Quinolinol sulfate potassium sulfate* substance/substance group, the following information is displayed to the user:

- Advice for the distinction from 8-hydroxyquinoline sulfate: 8-hydroxyquinoline sulfate is a spectrally similar substance, which is however currently not deliverable in Germany. Please decide, if an additional prove seems to be useful.

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Quinolinol sulfate potassium sulfate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Quinolinol sulfa…	13071104	20983	40	1403095
Caelo	Quinolinol sulfa…	13403501	21430	40	20131218
Caelo	Quinolinol sulfa…	15147704	22606	40	20150618
Caelo	Quinolinol sulfa…	162218	22626	40	20160808*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 4 reference samples from the substance/substance group *Quinolinol sulfate potassium sulfate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 4 different batches.

- 72 273 spectra from a total of 1578 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 180 spectra from 5 reference samples of the substance/substance group *Quinolinol sulfate potassium sulfate*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Dermapharm	Quinolinol sulfate potassium…	071101	20168	40
mibe GmbH	Quinolinol sulfate potassium…	100804	20573	40
Caelo	Quinolinol sulfate potassium…	13403501	21430†	20
Caelo	Quinolinol sulfate potassium…	15147704	22607	40
Caelo	Quinolinol sulfate potassium…	16221809	23563	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 893 spectra from a total of 3494 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 173 spectra from 84 *Apo-Ident* customers from 27 batches from the substance/substance group *Quinolinol sulfate potassium sulfate*.

- These include spectra of independent samples from 24 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Quinolinol sulfate potassium…	10F01-N15	1
Caelo	Quinolinol sulfate potassium…	140804	5
Fagron	Quinolinol sulfate potassium…	120905	1
Dermapharm	Quinolinol sulfate potassium…	100804	9
Caelo	Quinolinol sulfate potassium…	13071104	3
Phönix Gotha	Quinolinol sulfate potassium…	120905	4
Caelo	Quinolinol sulfate potassium…	13403501	7
Caelo	Quinolinol sulfate potassium…	13071106	1
Nachprüfung	Quinolinol sulfate potassium…	13071104	2
Caelo	Quinolinol sulfate potassium…	13403506	12
Dermapharm	Quinolinol sulfate potassium…	140804	38
Caelo	Quinolinol sulfate potassium…	13403513	1
Dermäphärm	Quinolinol sulfate potassium…	140804	1
Fagron	Quinolinol sulfate potassium…	140804	4
Caelo	Quinolinol sulfate potassium…	15147701	1
Caelo	Quinolinol sulfate potassium…	15147704	3
Caelo	Quinolinol sulfate potassium…	15147706	2
Caelo	Quinolinol sulfate potassium…	15147708	1
Caelo	Quinolinol sulfate potassium…	15147714	1
Caelo	Quinolinol sulfate potassium…	16221807	1
Dermapharm	Quinolinol sulfate potassium…	120905	41
Ebert-Jacobi	Quinolinol sulfate potassium…	16221804	1
Fagron	Quinolinol sulfate potassium…	13G10-N06	1
Caelo	Quinolinol sulfate potassium…	13071101	2
Caelo	Quinolinol sulfate potassium…	2210E-03423	1
Nachprüfung	Quinolinol sulfate potassium…	120905	2
Nachprüfung	Quinolinol sulfate potassium…	2812U03423	1
Dermopharm AG/Noweda	Quinolinol sulfate potassium…	140804	1
Phönix Gotha	Quinolinol sulfate potassium…	140804	1
Dermopharm AG	Quinolinol sulfate potassium…	140804	1
Pharmachen	Quinolinol sulfate potassium…	140804	1
Bombastus	Quinolinol sulfate potassium…	140804	2
Geilenkirchen/Dermopham	Quinolinol sulfate potassium…	140804	1
phönix	Quinolinol sulfate potassium…	140804	1
Dermapharm	Quinolinol sulfate potassium…	1470804	1
Mibe/Gehe	Quinolinol sulfate potassium…	140804	1
Stumpf	Quinolinol sulfate potassium…	100804	1
Fiebig ek: 5,68EUR	Quinolinol sulfate potassium…	100804	2
Phönix Gotha	Quinolinol sulfate potassium…	100804	2
Gehe	Quinolinol sulfate potassium…	120905	1
Caelo	Quinolinol sulfate potassium…	120905	1

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Supplier	Substance	Batch	Spectra
sanacorp	Quinolinol sulfate potassium…	120905	1
Mibe	Quinolinol sulfate potassium…	120905	1
dermopharm/Noweda	Quinolinol sulfate potassium…	120905	1
Caelo	Quinolinol sulfate potassium…	82716049	1
Caelo	Quinolinol sulfate potassium…	7051305	1
Caelo	Quinolinol sulfate potassium…	9106304	1
Caelo	Quinolinol sulfate potassium…	10281601	1
Caelo	Quinolinol sulfate potassium…	10281607	1
Gehe	Quinolinol sulfate potassium…	10281609	1

- 76 986 spectra from 463 *Apo-Ident* customers from a total of 25 525 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Quinolinol sulfate potassium - sulfate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Quinolinol sulfate potassium sulfate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	72 273
Type B	0	140	40	161 883
Type C	0	92	81	76 972

The substance/substance group *Quinolinol sulfate potassium sulfate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9928 %)	77.7778 % (> 76.1111 %)
Type C	100.0000 % (> 99.8850 %)	53.1792 % (> 51.4451 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

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Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20983	20983	0.00	58.35
21430	22626	21.40	63.01
22606	22626	2.88	65.16
22626	22626	0.00	66.37

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Resocrinol**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20938-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Resocrinol; Resorcinolum; Resorcinum

Special notes

When selecting the *Resocrinol* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Resocrinol*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Resocrinol	12G24-N04	20938	40	1401462
Caelo	Resocrinol	13293108	21471	40	AR-15-FG-006906-01
Fagron	Resocrinol	13I18-B09-291533	21706	30	20130606

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 110 spectra of 3 reference samples from the substance/substance group *Resocrinol*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 323 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 155 spectra from 5 reference samples of the substance/substance group *Resocrinol*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Resocrinol	11A19-N09	20240	40
Caelo	Resocrinol	13293108	21471†	20
Fagron	Resocrinol	13I18-B09-291533	21706†	15
Caelo	Resocrinol	161533	22632	40
Fagron	Resocrinol	17H03-B11-338899	23921	40

- 161 918 spectra from a total of 3494 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 119 spectra from 81 *Apo-Ident* customers from 55 batches from the substance/substance group *Resocrinol*.

- These include spectra of independent samples from 53 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Resocrinol	10218809	2
Fagron	Resocrinol	11/13-no2	1
Fargon	Resocrinol	11D29-2011	1
Caelo	Resocrinol	11d29-n14	2
Gehe	Resocrinol	11L13-N02	1
Fagron	Resocrinol	1112013A	1
Caelo	Resocrinol	2041512	1
Caelo	Resocrinol	10111210	1
Phönix Gotha	Resocrinol	10218802	1
Fagron	Resocrinol	11/13-N02	3
Euro OTC	Resocrinol	11/13-N02	1
Caelo	Resocrinol	11309602	1
Caelo	Resocrinol	11309610	4
Fagron	Resocrinol	118b09291534	1
Fagron	Resocrinol	11A19-N09	1
Fagron	Resocrinol	11L19-N19	4
Caelo	Resocrinol	11A19-N09	1
Fagron	Resocrinol	12/16010	1
Caelo	Resocrinol	12255614	2
Fagron	Resocrinol	12G24-N004	1
Fagron	Resocrinol	12G24-N04	11
Anzag 08.02.2013	Resocrinol	12G24-N04	1
Caelo	Resocrinol	12G24-N04	2
vdl	Resocrinol	12G24-N04	1
Gehe	Resocrinol	12G24-N04	1
Gehe	Resocrinol	12G-24-N04	1
Euro OTC	Resocrinol	12g24-n04	1
Gehe 16.06.2013	Resocrinol	12G24-N04	1
Fagron	Resocrinol	12g24-N04	1
Fagron	Resocrinol	12K30-N03	5
anzag 13.09.13	Resocrinol	12K30N30	1
Fagron	Resocrinol	13/17071	1
Fagron	Resocrinol	13/18-B09-291534	1
Caelo	Resocrinol	13/18-B09291534	1
Caelo	Resocrinol	13/18-B19-291534	1
Noweda	Resocrinol	1318b09291533	1
Caelo	Resocrinol	13293103	1
Caelo	Resocrinol	13293110	1
Caelo	Resocrinol	13293115	2
Fagron	Resocrinol	13E24-N10	10
Gehe	Resocrinol	13E24-N10	1
Noweda	Resocrinol	13E24-N10	1
Fagron	Resocrinol	13I18-B09	2
Phoenix goettin	Resocrinol	13I18-B09-291534	1
Fagron	Resocrinol	13I18-B09-291533	1
Fagron	Resocrinol	14/16062	1
Fagron	Resocrinol	14/19050	1
Fagron	Resocrinol	14G10B06	1

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Supplier	Substance	Batch	Spectra
Fagron	Resocrinol	14G10-B06	1
Fagron	Resocrinol	14G10-B06-296296	5
Phönix Gotha	Resocrinol	14G10-B06-296296	1
Fagron	Resocrinol	14G10-B06-296297	3
Fagron	Resocrinol	14J15-B02	1
Fagron	Resocrinol	14J15-B02-307749	4
Fagron	Resocrinol	15/18082	1
Caelo	Resocrinol	15009502	1
Caelo	Resocrinol	15009507	4
Caelo	Resocrinol	15009511	2
Fagron	Resocrinol	15K24-B02-317584	2
Caelo	Resocrinol	15K24-B02-317584	1
Fagron	Resocrinol	16D29-B01-323046	1
Fagron	Resocrinol	16D29-B01-329760	1
Caelo	Resocrinol	19061305	1
Caelo	Resocrinol	206370-0003	1
Fagron	Resocrinol	2112I-02170	1
Caelo	Resocrinol	5052	1
Fagron	Resocrinol	13I18-B09-291534	1
GEHE	Resocrinol	11L19-N19	1

- 77 040 spectra from 463 *Apo-Ident* customers from a total of 25 494 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Resocrinol* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Resocrinol* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	110	0	72 323
Type B	0	155	0	161 918
Type C	0	118	1	77 040

The substance/substance group *Resocrinol* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 94.5455 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 96.1290 %)
Type C	100.0000 % (> 99.8850 %)	99.1597 % (> 96.6387 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to

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exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20938	20938	0.00	37.90
21471	21471	0.00	33.05
21706	21471	4.95	26.22

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Ribavirin**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	22346-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Ribavirin; Ribavirinum

Special notes

When selecting the *Ribavirin* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Ribavirin*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Ribavirin	1304027-01	22346	30	AR-16-FG-007485-01
Euro OTC	Ribavirin	1308001	22382	30	20130902*
Euro OTC	Ribavirin	1604012	22528	40	20160428*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 100 spectra of 3 reference samples from the substance/substance group *Ribavirin*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 333 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 70 spectra from 3 reference samples of the substance/substance group *Ribavirin*.

- These include spectra of independent samples from 1 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Ribavirin	1304027-01	22346†	15
Euro OTC	Ribavirin	1308001	22382†	15
Euro OTC	Ribavirin	1304027-02	23023	40

- 162 003 spectra from a total of 3496 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 0 spectra from 0 *Apo-Ident* customers from 0 batches from the substance/substance group *Ribavirin*.

- These include spectra of independent samples from 0 batches, of which no spectra have been used for the generation of the database.

- 77 159 spectra from 463 *Apo-Ident* customers from a total of 25 547 batches from a further 701 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Ribavirin* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ribavirin* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	100	0	72 333
Type B	0	70	0	162 003
Type C	0	0	0	77 159

The substance/substance group *Ribavirin* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 94.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 91.4286 %)
Type C	100.0000 % (> 99.8849 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
22346	22346	0.00	25.34
22382	22382	0.00	31.33
22528	22528	0.00	18.99

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Riboflavin**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20409-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Riboflavin; Riboflavinum

Special notes

When selecting the *Riboflavin* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Riboflavin*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Riboflavin	13D02-N03	20825	40	AR-15-FG-000733-01
AppliChem	Riboflavin	3E003567	20893	40	20130128
Caelo	Riboflavin	12003317	20925	40	1405155
Caelo	Riboflavin	13305203	21389	40	AR-15-FG-005686-01
Fagron	Riboflavin	15G20-B13-310997	21955	40	20150819

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Riboflavin	14322008	22492	40	AR-16-FG-013669-01
Fagron	Riboflavin	16B18-B06-319026	22655	40	AR-16-FG-014466-01
Euro OTC	Riboflavin	1701050	23004	40	20170214*
Fagron	Riboflavin	17G14-B05-337885	23714	40	AR-18-FG-000141-01

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 360 spectra of 9 reference samples from the substance/substance group *Riboflavin*. These samples are listed above in the section *calibration samples*. The reference samples originate from 9 different batches.

- 72 073 spectra from a total of 1573 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 470 spectra from 13 reference samples of the substance/substance group *Riboflavin*.

- These include spectra of independent samples from 8 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Riboflavin	10F23-N06	20409	40
Fagron	Riboflavin	11L29-N01	20581	40
Fagron	Riboflavin	11L29-N01	20587	40
Fagron	Riboflavin	zu erfassen	20609	40
Fagron	Riboflavin	10F23-N06	20641	30

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*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Riboflavin	13D02-N03	20914	40
Caelo	Riboflavin	13305203	21389†	20
Fagron	Riboflavin	15G20-B13-310997	21955†	20
Euro OTC	Riboflavin	1701050-01	23091	40
Caelo	Riboflavin	15330708	23579	40
Euro OTC	Riboflavin	1707017	23612	40
Caelo	Riboflavin	172722	23649	40
Euro OTC	Riboflavin	1801018	23880	40

- 161 603 spectra from a total of 3489 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 25 spectra from 15 *Apo-Ident* customers from 20 batches from the substance/substance group *Riboflavin*.

- These include spectra of independent samples from 19 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Riboflavin	11L29-N01	1
Fagron	Riboflavin	6120	1
Fagron	Riboflavin	12J17-N07	2
Fagron	Riboflavin	12H30-N02	1
Vdl 09.05.14;Preis 7,45	Riboflavin	13305203/15R05	1
Fagron	Riboflavin	13J29-B04-287534	1
Fagron	Riboflavin	13J29-B04-287533	1
Caelo	Riboflavin	14322009	1
Fagron	Riboflavin	14B03-B07-292071	2
Fagron	Riboflavin	14B03B07292071	1
Fagron	Riboflavin	14E01-B10-296718	1
Fagron	Riboflavin	14K03-B04-304718	1
Caelo	Riboflavin	15330708	1
Fagron	Riboflavin	15G20-B13-310997	2
Fagron	Riboflavin	15I09-B02-315216	1
Fagron	Riboflavin	167720-0005	2
Fagron	Riboflavin	16B18b06319026	1
Euro OTC	Riboflavin	L1210048-01	1
Euro OTC	Riboflavin	L1305039-01	2
Fagron	Riboflavin	11K02-N01	1

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

- 77 134 spectra from 463 *Apo-Ident* customers from a total of 25 528 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Riboflavin* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Riboflavin* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	360	0	72 073
Type B	0	428	42	161 603
Type C	0	24	1	77 134

The substance/substance group *Riboflavin* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9887 %)	100.0000 % (> 98.3333 %)
Type B	100.0000 % (> 99.9928 %)	91.0638 % (> 90.4255 %)
Type C	100.0000 % (> 99.8850 %)	96.0000 % (> 84.0000 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20825	20825	0.00	19.87
20893	22492	9.42	20.59
20925	20925	0.00	19.58
21389	21389	0.00	16.31
21955	21389	5.96	17.63
22492	22492	0.00	27.64
22655	22655	0.00	21.58
23004	23004	0.00	16.59
23714	23714	0.00	23.50

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Riboflavin phosphate sodium**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20948-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Riboflavin phosphate sodium; Natrii lactoflavini phosphoricum; Riboflavini natrii phosphas

Special notes

When selecting the *Riboflavin phosphate sodium* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Riboflavin phosphate sodium*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Riboflavin phosp…	13I26-N06	20948	40	1403705
Fagron	Riboflavin phosp…	15J02-B03-313137	22269	40	AR-16-FG-009883-02
Fagron	Riboflavin phosp…	17A03-B01-335897	23713	40	AR-18-FG-000920-01

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Riboflavin phosphate sodium*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 65 spectra from 2 reference samples of the substance/substance group *Riboflavin phosphate sodium*.

- These include spectra of independent samples from 1 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Riboflavin phosphate sodium	14J31-B07-300519	21707	45
Fagron	Riboflavin phosphate sodium	15J02-B03-313137	22269†	20

- 162 008 spectra from a total of 3497 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 6 spectra from 2 *Apo-Ident* customers from 5 batches from the substance/substance group *Riboflavin phosphate sodium*.

- These include spectra of independent samples from 5 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Riboflavin phosphate sodium	12k07-N12	1
Fagron	Riboflavin phosphate sodium	13126-N06	1
Fagron	Riboflavin phosphate sodium	15J02-B03	1
Fagron	Riboflavin phosphate sodium	11G15-N06	2
Fagron	Riboflavin phosphate sodium	11K24-N01	1

- 77 153 spectra from 463 *Apo-Ident* customers from a total of 25 542 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Riboflavin phosphate sodium* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Riboflavin phosphate sodium* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	65	0	162 008
Type C	0	6	0	77 153

The substance/substance group *Riboflavin phosphate sodium* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 90.7692 %)
Type C	100.0000 % (> 99.8852 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20948	20948	0.00	17.59
22269	22269	0.00	13.68
23713	23713	0.00	28.84

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Saccharin sodium**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20200-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Saccharin sodium; Saccharinum natricum; Saccharinum solubile; Sodium saccharin

Special notes

When selecting the *Saccharin sodium* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Saccharin sodium*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Saccharin sodium	13I20-B06-291654	23020	40	AR-17-FG-012457-01
Fagron	Saccharin sodium	14F30-B02-296322	23452	40	AR-17-FG-022421-01
Fagron	Saccharin sodium	14F30-B02-296322	23453	40	AR-18-FG-007117-02
Caelo	Saccharin sodium	172110	23643	40	20170831*
Caelo	Saccharin sodium	162210	23857	39	20160811*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 199 spectra of 5 reference samples from the substance/substance group *Saccharin sodium*. These samples are listed above in the section *calibration samples*. The reference samples originate from 4 different batches.

- 72 234 spectra from a total of 1578 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 120 spectra from 3 reference samples of the substance/substance group *Saccharin sodium*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Saccharin sodium	10170511	20200	40
Fagron	Saccharin sodium	12E03-N01	20482	40
Caelo	Saccharin sodium	15087704	22769	40

- 161 953 spectra from a total of 3496 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 97 spectra from 72 *Apo-Ident* customers from 43 batches from the substance/substance group *Saccharin sodium*.

- These include spectra of independent samples from 42 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Saccharin sodium	13205411	1
Caelo	Saccharin sodium	13205414	3
Caesar & Loretz GmbH Hi...	Saccharin sodium	13205418	2
sanacorp	Saccharin sodium	13205418	1
Caelo	Saccharin sodium	1402970	1
Caelo	Saccharin sodium	14029705	5
Caelo	Saccharin sodium	14029707	3
Sana 03.11.14 EK 3,95	Saccharin sodium	14029707	1
Caelo	Saccharin sodium	14029709	1
Caelo	Saccharin sodium	14029710	3
Caelo	Saccharin sodium	14213402	3
Caelo	Saccharin sodium	14213405	3
Caelo	Saccharin sodium	15084101	4
Caelo	Saccharin sodium		1
Caelo	Saccharin sodium	15087703	6
Cael Sanacorp 05.02.2016	Saccharin sodium	15087703	1
Caelo	Saccharin sodium	15087704	8
Euro OTC	Saccharin sodium	15087704	1
Caelo	Saccharin sodium	15087707	1
Jenne	Saccharin sodium	15087707	1
Caelo	Saccharin sodium	15087713	10
Caelo	Saccharin sodium	16221010	1
Caelo	Saccharin sodium	16221005	3
Caelo	Saccharin sodium	17211002	2
Caelo	Saccharin sodium	21092015A	1
Caelo	Saccharin sodium	3131-02206	1
Caelo	Saccharin sodium	10170504	1
Caelo	Saccharin sodium	11025610	1
Caelo	Saccharin sodium	11025605	1
Caelo	Saccharin sodium	11172805	3
Caelo	Saccharin sodium	11172814	1
Fagron	Saccharin sodium		1
Caelo	Saccharin sodium	1236207	1
Caelo	Saccharin sodium	12139803	1
Caelo	Saccharin sodium	12362607	3
Fagron	Saccharin sodium	12A13-N03	1
Fargon	Saccharin sodium	12A13-N03	1
Caelo	Saccharin sodium	12C08-N08	1
Fagron	Saccharin sodium	12E03-N01	1
Fagron	Saccharin sodium	12F19-N039/16	1
Fagron	Saccharin sodium	12K26-N09	1
Fagron	Saccharin sodium	13D19-N01	3
Caesar&loretz,Phoenix	Saccharin sodium	15084101	1
Phönix Gotha	Saccharin sodium	1I12-N04	1
Caelo	Saccharin sodium	82885059	1
Caelo	Saccharin sodium	90542309	1
Fagron	Saccharin sodium	SH203/11	1
Caelo	Saccharin sodium	13205408	1
Fagron	Saccharin sodium	SH349/12	1

- 77 062 spectra from 463 *Apo-Ident* customers from a total of 25 504 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Saccharin sodium* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Saccharin sodium* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	199	0	72 234
Type B	0	87	33	161 953
Type C	0	36	61	77 062

The substance/substance group *Saccharin sodium* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.9849 %)
Type B	100.0000 % (> 99.9928 %)	72.5000 % (> 70.0000 %)
Type C	100.0000 % (> 99.8850 %)	37.1134 % (> 34.0206 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
23020	23020	0.00	69.21
23452	23452	0.00	84.70
23453	23453	0.00	79.78
23643	23643	0.00	84.64
23857	23857	0.00	83.35

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Salicylic acid**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20015-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Salicylic acid; Acidum salicylicum

Special notes

When selecting the *Salicylic acid* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Salicylic acid*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Salicylic acid	1110020-01	20696	40	20120125
Caelo	Salicylic acid	13344018	21760	40	20131020
Euro OTC	Salicylic acid	1509007	21906	40	20150929*
Caelo	Salicylic acid	160109	22443	40	20160229*
Fagron	Salicylic acid	16I15-B08-333932	23592	40	20170210

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 200 spectra of 5 reference samples from the substance/substance group *Salicylic acid*. These samples are listed above in the section *calibration samples*. The reference samples originate from 5 different batches.

- 72 233 spectra from a total of 1577 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 410 spectra from 11 reference samples of the substance/substance group *Salicylic acid*.

- These include spectra of independent samples from 8 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Salicylic acid	82732219	20015	30
Caelo	Salicylic acid	13344002	21436	60
Caelo	Salicylic acid	13344018	21760†	20
Euro OTC	Salicylic acid	1509007	21906†	20
Caelo	Salicylic acid	160109	22443†	20
Caelo	Salicylic acid	160500	22448	60
Euro OTC	Salicylic acid	1605023	22685	40
Caelo	Salicylic acid	171333	23277	40
Euro OTC	Salicylic acid	1707009	23556	40
Caelo	Salicylic acid	173015	23827	40
Euro OTC	Salicylic acid	1801042	23968	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*).

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- 161 663 spectra from a total of 3488 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 1280 spectra from 346 *Apo-Ident* customers from 286 batches from the substance/substance group *Salicylic acid*.

- These include spectra of independent samples from 276 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Euro OTC	Salicylic acid	1106014-01	1
Caelo	Salicylic acid	11197103	2
Caelo	Salicylic acid	12134720	10
Caelo	Salicylic acid	12374211	20
Gutenberg-Apotheke	Salicylic acid	12374208	1
Caelo	Salicylic acid	12374212	2
Caelo	Salicylic acid	13344002	20
Caelo	Salicylic acid	13344018	16
Caelo	Salicylic acid	13344013	10
Caelo	Salicylic acid	14076202	6
Euro OTC	Salicylic acid	1406027-02	9
Caelo	Salicylic acid	13344020	19
Caelo	Salicylic acid	14076204	11
Caelo	Salicylic acid	14076207	10
Caelo	Salicylic acid	14076206	8
Caelo	Salicylic acid	14300802	7
Caelo	Salicylic acid	14300809	12
Caelo	Salicylic acid	14336907	25
Anzag; 24.7.15; 15,82EUR	Salicylic acid	15084402	1
Caelo	Salicylic acid	14336920	14
Caelo	Salicylic acid	14336911	15
Caelo	Salicylic acid	15217302	17
Caelo	Salicylic acid	15217301	6
Caelo	Salicylic acid	15211808	6
Caelo	Salicylic acid	15211809	13
Caelo	Salicylic acid	16010903	7
Caelo	Salicylic acid	16010913	8
Caelo	Salicylic acid	16010917	5
Caelo	Salicylic acid	15084403	6
Caelo	Salicylic acid	11197117	2
Caelo	Salicylic acid	9220716	1
Caelo	Salicylic acid	16010907	4
Caelo	Salicylic acid	11311923	3
Caelo	Salicylic acid	12036211	4
Caelo	Salicylic acid	11311918	1
Caelo	Salicylic acid	12134702	14

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Hence, these spectra are not independent and are not of *Type B*.

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Supplier	Substance	Batch	Spectra
Caelo	Salicylic acid	12036216	5
Caelo	Salicylic acid	12036225	4
Caelo	Salicylic acid	12134714	18
Anzag	Salicylic acid	12036208	1
Caelo	Salicylic acid	12134710	3
Sanacorp	Salicylic acid	123036223	1
Caelo	Salicylic acid	12134711	8
Caelo	Salicylic acid	12134709	32
Caelo	Salicylic acid	12134717	13
Caelo	Salicylic acid	12374207-3454311172	1
Sanacorp	Salicylic acid	12374205	1
Fagron	Salicylic acid	13B14-N01	18
Caelo	Salicylic acid	12H10-N08	5
Euro OTC	Salicylic acid	1303020-01	21
Fagron	Salicylic acid	13H01-N04	17
Caelo	Salicylic acid	3601413011-12374211	1
Holdermann	Salicylic acid	14E26-B04294624	1
Fagron	Salicylic acid	13H01-N08	2
Caelo	Salicylic acid	12134721	2
Caelo	Salicylic acid	12374207	9
14076202	Salicylic acid		1
Caelo	Salicylic acid	7071403	1
Caelo	Salicylic acid	10112014B	1
Euro OTC	Salicylic acid	102455	1
Caelo	Salicylic acid	10355907	1
Euro OTC	Salicylic acid	1110020-01	5
Alliance 19.12.12	Salicylic acid	11311906	1
Caelo	Salicylic acid	12134707	8
Caelo	Salicylic acid	12036226	10
Caesar & Loretz GmbH Hi...	Salicylic acid	12134714	1
Caelo	Salicylic acid	12134715	9
Caelo	Salicylic acid	12134719	3
Caelo	Salicylic acid	12134722	4
Klenk	Salicylic acid	12134722	1
Caelo	Salicylic acid	12323403	3
Caelo	Salicylic acid	12374208	2
Caesar&Loretz GmbH/Anzag	Salicylic acid	12374210	2
Phönix	Salicylic acid	12374210	1
Phönix	Salicylic acid	12374211	1
Caelo	Salicylic acid	12374213	12
Caelo	Salicylic acid	1274210	1
Sanacorp	Salicylic acid	1303020-01	1
Euro OTC	Salicylic acid	130302001	1
Caelo	Salicylic acid	1303020-01	3
EuRho	Salicylic acid	1303020-01	4
Euro OTC	Salicylic acid	1303020-02	5
Euro OTC	Salicylic acid		1
Caelo	Salicylic acid	13032014A	1
Anzag/Henry Lamotte	Salicylic acid	1334018	1
AHD	Salicylic acid	13344002	1
Gehe	Salicylic acid	13344002	1
Caelo	Salicylic acid	13344003	11
Caesar & Loretz GmbH	Salicylic acid	13344003	1
Fagron	Salicylic acid	13344013	1
Caelo	Salicylic acid	13344014	6
Sanacorp	Salicylic acid	13344014	1
Caesar & Loretz GmbH Hi...	Salicylic acid	13344018	1
Caelo	Salicylic acid	1334403	1
Caelo	Salicylic acid	133454002	1
AHD 22.07.14	Salicylic acid	134002	1

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Supplier	Substance	Batch	Spectra
Fagron	Salicylic acid	13H01-N01	7
Fagron	Salicylic acid	13H01N04	4
Großhandel	Salicylic acid	13H01-N04	1
Gehe	Salicylic acid	13H01-N04	1
Caelo	Salicylic acid	13H01-N04	2
Fagron	Salicylic acid	13H01N08	1
Fagron	Salicylic acid	13K08-B31-290852	5
Fagron	Salicylic acid	13K08-B31-290853	4
Phönix	Salicylic acid	13K08-B31-290853	1
Gehe	Salicylic acid	1406027-01	1
Euro OTC	Salicylic acid	1406027-01	9
Caelo	Salicylic acid	140602701	1
Noweda	Salicylic acid	1406027-01	1
Caelo	Salicylic acid	1406027-01	2
EuRho	Salicylic acid	1406027-01	1
Caelo	Salicylic acid	1406027-02	2
Euro OTC	Salicylic acid	140602702	1
EuRho	Salicylic acid	1406027-02	1
Noweda	Salicylic acid	140602702	1
Euro OTC	Salicylic acid	1406027-02Mg1kg	1
Caelo	Salicylic acid	14076201	3
Phönix Gotha	Salicylic acid	14076201	1
Phoenix	Salicylic acid	14076201	1
Euro OTC	Salicylic acid	14076202	1
Caelo	Salicylic acid	14076203	8
Caesar&Loretz GmbH/Anzag	Salicylic acid	14076203	2
Sanacorp 28.01.15 EK 12. . .	Salicylic acid	14076204	1
Fagron	Salicylic acid	14076207	2
Caelo	Salicylic acid	14076211	1
Caelo	Salicylic acid	14076212	2
Euro OTC	Salicylic acid	1408027	1
Caelo	Salicylic acid	14300801	6
Phönix Gotha	Salicylic acid	14300801	1
Caelo	Salicylic acid	14300804	6
Caesar&Loretz Anzag	Salicylic acid	14300804	2
Caelo	Salicylic acid	14300805	9
Caelo	Salicylic acid	14300806	1
Phoenix goettingen	Salicylic acid	14300808	1
Caelo	Salicylic acid	14300808	1
Caesar & Loretz GmbH	Salicylic acid	14300809	1
Caelo	Salicylic acid	14336904	1
Caelo	Salicylic acid	1430802	1
Caelo	Salicylic acid	14336905	7
Caelo	Salicylic acid	14336906	2
Noweda	Salicylic acid	14336907	2
Caelo	Salicylic acid	14336908	1
Caelo	Salicylic acid	14336912	6
Caelo	Salicylic acid	14336919	9
Caelo	Salicylic acid	14336921	1
Fagron	Salicylic acid	14B05-B30	3
Fagron	Salicylic acid	14B05B30	1
Fagron	Salicylic acid	14B05-B30-290854	5
Fagron	Salicylic acid	14E26B04	2
Fagron	Salicylic acid	14E26-B04	7
Fagron	Salicylic acid	14E26-B04294623	1
Fagron	Salicylic acid	14E26-B04-294622	3
Euro OTC	Salicylic acid	14E26-B04-294622	1
Fagron	Salicylic acid	14E26-B04-294623	6
Fagron	Salicylic acid	14E26B04294623	1
Fagron	Salicylic acid	14E26-B04-294624	5

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Supplier	Substance	Batch	Spectra
Fagron	Salicylic acid	14L02-B02	5
Fargon	Salicylic acid	14L02-B02	1
Fagron	Salicylic acid	14L02-B02-303557	10
Fagron	Salicylic acid	14L02B02303557	1
Fagron	Salicylic acid	14L02-B02-303558	6
Caelo	Salicylic acid	15084401	3
Novacyl, FR	Salicylic acid	15084403	2
Caelo	Salicylic acid	15084404	4
Sanacorp	Salicylic acid	15084404	1
Euro OTC	Salicylic acid	1509007-01	22
Caelo	Salicylic acid	1509007-01	1
Caelo	Salicylic acid	152117304	1
Caelo	Salicylic acid	15211803	2
Caelo	Salicylic acid	15211806	3
Caesar&Loretz/AHD	Salicylic acid	15211808	1
Caelo	Salicylic acid	15211810	6
Caesar&Loretz GmbH/Sana...	Salicylic acid	15217301	1
caesar	Salicylic acid	15217301	1
Caelo	Salicylic acid	15217303	10
Caelo	Salicylic acid	15217304	5
Caelo	Salicylic acid	15217305	4
Caelo	Salicylic acid	15217308	6
Caelo	Salicylic acid	16010905	3
Caelo	Salicylic acid	16010906	9
Caelo	Salicylic acid	16050012	5
Caelo	Salicylic acid	16050014	3
Euro OTC	Salicylic acid	1605023-02	3
Caelo	Salicylic acid	16072014A	1
Caesar&Loretz GmbH,15.0...	Salicylic acid	16312001	1
Phönix	Salicylic acid	16a18-b04-322905	1
Caelo	Salicylic acid	1714Q1045	1
Caelo	Salicylic acid	18121412	1
Caelo	Salicylic acid	23071510	1
Fagron	Salicylic acid	290852	1
xxx	Salicylic acid	4311A-01045	1
Sanacorp	Salicylic acid	68/AKD2	1
Phönix	Salicylic acid	68/AKD4	1
ACM	Salicylic acid	KNC0461J15	1
Farmalabor / Farmalabor	Salicylic acid	P1404195-002	1
Caelo	Salicylic acid		7
Caelo	Salicylic acid	8170717	1
Ichthyol/Noweda	Salicylic acid	13344003	1
Caaelo	Salicylic acid	14336911	1
Caelo	Salicylic acid	14336913	1
Sanacorp	Salicylic acid	14336919	1
Lamotte/Sanacorp	Salicylic acid	14E25-B04	1
Bombastus	Salicylic acid	14L02-B02-303557	1
Caelo	Salicylic acid	15081601	1
Euro OTC	Salicylic acid	1509007/02	1
EurRho/ Anzag	Salicylic acid	1509007-01	1
Euro OTC	Salicylic acid	1509007-02	6
Phönix	Salicylic acid	1509007-02	1
EuRho 001	Salicylic acid	1509007-02	1
Caelo	Salicylic acid	151224/1	1
Caelo	Salicylic acid	15211807	2
Phoenix	Salicylic acid	15211808	2
Fagron	Salicylic acid	15211809	1
Fagron	Salicylic acid	16/15-B08-332098	1
Fagron	Salicylic acid		1
Fagron	Salicylic acid	16/15-B08-330773	2

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Supplier	Substance	Batch	Spectra
Caelo	Salicylic acid	16010901	2
Ebert 24.08.16	Salicylic acid	16010903	1
Caelo	Salicylic acid	16010904	4
Caelo	Salicylic acid	16010908	1
Celo/ Sanacorp	Salicylic acid	16010908	1
Caelo	Salicylic acid	16010910	7
Sana 04.02.17 Ek:13,83	Salicylic acid	16010910	1
Gehe	Salicylic acid	16010910	1
Caelo	Salicylic acid	16010911	1
Caelo	Salicylic acid	16010916	1
Caelo	Salicylic acid	16010918	3
Caelo	Salicylic acid	16010922	3
Caelo	Salicylic acid	16010923	1
Caelo	Salicylic acid	16010972	1
Caelo	Salicylic acid	1601916	1
Caelo	Salicylic acid	160500004	3
Caelo	Salicylic acid	16050003	2
Caelo	Salicylic acid	16050004	7
Caelo	Salicylic acid	16050005	8
Phönix	Salicylic acid	16050005	1
Caelo	Salicylic acid	16050011	5
Caelo	Salicylic acid	16050013	3
Euro OTC	Salicylic acid	1605023/02	1
Euro OTC	Salicylic acid	1605023-01	6
Euro OTC	Salicylic acid	160502301	2
Bombastus	Salicylic acid	1605023-01	1
Caelo	Salicylic acid	1605023-01	1
Caelo	Salicylic acid	16312001	5
Caesar & Loretz GmbH	Salicylic acid	16312001	1
Caelo	Salicylic acid	16312003	1
Caelo	Salicylic acid	16312005	1
Caelo	Salicylic acid	16312008	1
Caelo	Salicylic acid	16312010	1
Fagron	Salicylic acid	16A18-B04-322904	1
Fagron	Salicylic acid	16A18-B04-322905	2
Fagron	Salicylic acid	16A18-B04322904	1
Caelo	Salicylic acid	16E02-B09-325355	1
Fagron	Salicylic acid	16I15-B08-327353	2
Fagron	Salicylic acid	16I15-B08-330773	1
Euro OTC	Salicylic acid	1707009-01	2
Caelo	Salicylic acid	1707009-01	1
Fiebig/Maros	Salicylic acid	1707009-02	1
Caelo	Salicylic acid	17133301	1
Caelo	Salicylic acid	17301502	1
Caelo	Salicylic acid	17301504	1
Caelo	Salicylic acid	RAS1135100	1
Caelo	Salicylic acid	Validierungsmessung	1
Caelo	Salicylic acid	1101301	1
Caelo	Salicylic acid	8101204	1
Caelo	Salicylic acid	1738980	1
Caelo	Salicylic acid	9091301	1
Caelo	Salicylic acid	9112013A	1
Caesar&loretz,Phoenix	Salicylic acid	9220710	1
Gehe 27.09.13	Salicylic acid	9220708	1
Caelo	Salicylic acid	9220715	1
GEHE	Salicylic acid	102455-0002	1
Fagron	Salicylic acid	102455-0002	2
Caelo	Salicylic acid	10291803	1
Caelo	Salicylic acid	10291804	2
Caelo	Salicylic acid	10291808	1

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Supplier	Substance	Batch	Spectra
Caelo	Salicylic acid	10291824	1
Caelo	Salicylic acid	10355911	3
Caelo	Salicylic acid	10355912	1
Caesar & Loretz GmbH 40...	Salicylic acid	10355916	1
Caelo	Salicylic acid	10355916	2
Anzag	Salicylic acid	1106014-01	1
Gehe	Salicylic acid	1106014-01	1
Euro OTC	Salicylic acid	1110020	1
Noweda	Salicylic acid	1110020-01	1
Caesar&loretz,Phoenix	Salicylic acid	11197104	1
Spangropharm	Salicylic acid	11197104	1
Noweda	Salicylic acid	11197105	1
Caelo	Salicylic acid	11197106	1
Caelo	Salicylic acid	11197118	1
Caelo	Salicylic acid	11197121	1
Phönix, 02.11.2012	Salicylic acid	11197121	1
Fagron	Salicylic acid	11197121	1
VDL	Salicylic acid	11197122	1
Noweda	Salicylic acid	11197123	2
Caelo	Salicylic acid	11197123	8
Phönix	Salicylic acid	11311902	1
Caelo	Salicylic acid	11311902	2
Noweda	Salicylic acid	11311903	1
Caelo	Salicylic acid	11311903	2
Caelo	Salicylic acid	11311904	2
Caesar & Loretz GmbH D-...	Salicylic acid	11311904	1
Kehr	Salicylic acid	11311904	1
Gehe	Salicylic acid	11311904	1
Caelo	Salicylic acid	11311905	1
Caelo	Salicylic acid	11311906	5
Anzag am 08.06.2012	Salicylic acid	11311906	1
Caelo	Salicylic acid	11311910	4
Caelo	Salicylic acid	11311916	2
Anzag 31.01.13 ek: 6,34EUR	Salicylic acid	11311916	1
Phönix	Salicylic acid	11311917	1
Ichthyol/Anzag	Salicylic acid	11311917	1
Caelo	Salicylic acid	11311917	4
Caesar & Loretz GmbH, 4...	Salicylic acid	11311917	1
Caelo	Salicylic acid	11311922	9
Sanacorp	Salicylic acid	11311922	1
Anzag 05.01.13	Salicylic acid	11311922	1
GEHE	Salicylic acid	11311922	1
Caesar & Loretz GmbH	Salicylic acid	11311922	1
Ichthyol	Salicylic acid	11311922	2
Phönix 17.06.2013	Salicylic acid	11311923	1
Caelo	Salicylic acid	1131922	1
Caelo	Salicylic acid	1197106	1
Euro OTC	Salicylic acid	115465478596	1
Fagron	Salicylic acid	11B14-N13	2
Gehe	Salicylic acid	11D15-N08	1
Fagron	Salicylic acid	11K10-N01	4
Fagron	Salicylic acid	11L19-N21	3
Großhandel	Salicylic acid	11K10-N01	1
Caelo	Salicylic acid	12036202	6
Phönix	Salicylic acid	11127-N05	1
Caelo	Salicylic acid	12036208	2
Caelo	Salicylic acid	12036209	5
Noweda	Salicylic acid	12036210	1
Phönix Gotha	Salicylic acid	12036210	1
Caelo	Salicylic acid	12036210	3

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Supplier	Substance	Batch	Spectra
Caesar&loretz,Anzag	Salicylic acid	12036211	1
Caelo	Salicylic acid	12036215	3
Noweda	Salicylic acid	12036215	1
Alliance Healthcare	Salicylic acid	12036215	1
Alliance Healthcare	Salicylic acid	12036216	1
Caelo	Salicylic acid	12036217	2
Caelo	Salicylic acid	12036223	9
Noweda	Salicylic acid	12036223	2
Bombastus	Salicylic acid	12036223	2
Noweda	Salicylic acid	12036226	1
Caelo	Salicylic acid	12036315	2
EuRho	Salicylic acid	1206007-01	2
Euro OTC	Salicylic acid	1206007-01	11
Gehe	Salicylic acid	1206007-01	1
Caelo	Salicylic acid	12104709	1
Sanacorp	Salicylic acid	12134707	1
AHD, 24.05.2013	Salicylic acid	12134707	1
Caelo	Salicylic acid	12134712	4
Sanacorp	Salicylic acid	12134712	1
Caelo	Salicylic acid	12134713	1
carlo	Salicylic acid	12134714	2
Sanacorp	Salicylic acid	12134715	1
Caelo	Salicylic acid	12323401	2
Caelo	Salicylic acid	123134712	1
Phönix	Salicylic acid	12323401	1
Caelo	Salicylic acid	12323402	2
Bombastus	Salicylic acid	12323403	1
Caelo	Salicylic acid	1234	1
Jenne	Salicylic acid	12345	1
Caelo	Salicylic acid	1234709	2
Caelo	Salicylic acid	12374204	1
Caesar&Loretz GmbH/Anzag	Salicylic acid	12374204	1
Caelo	Salicylic acid	12374205	14
Europ Ots Pharma	Salicylic acid	12374205	1
Phönix Gotha	Salicylic acid	12374207	1
Caelo	Salicylic acid	12374210	3
Sanacorp	Salicylic acid	12374210	1
Fagron	Salicylic acid	12C20-N04	1
Fagron	Salicylic acid	12C20-N12	6
Großhandel	Salicylic acid	12C20-N12	1
Phönix	Salicylic acid	12C20-N12	1
Fagron	Salicylic acid	12H10-N03	7
Großhandel	Salicylic acid	12H10-N03	1
Fagron	Salicylic acid	12H10-N08	7
Phoenix	Salicylic acid	12H10-No8	1
Fagron	Salicylic acid	12H1-N03	1
Phönix	Salicylic acid	1303020-01	1
Eurho/Phoenix	Salicylic acid	13B14-N01	2
Gehe	Salicylic acid	13B14-N01	1
Fagron	Salicylic acid	13B14-No1	2
Fagron	Salicylic acid	13H01N01	1
Caelo	Salicylic acid	13H01-N01	1
Caesar&loretz,Phoenix	Salicylic acid	14076212	1
Fagron	Salicylic acid	14e26-b04-294623	1
Euro OTC	Salicylic acid	14336920	1
Caelo	Salicylic acid	1913Q-01045	1
Caelo	Salicylic acid	20111306	1
Caelo	Salicylic acid	20151112-4	1
Caelo	Salicylic acid	20270312-2	1
Caelo	Salicylic acid	25041304	1

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Supplier	Substance	Batch	Spectra
Caelo	Salicylic acid	3111J01045	1
Fagron	Salicylic acid	3111Q-01045	1
Caelo	Salicylic acid	4010Q-01045	1
Caelo	Salicylic acid	3613A-01045	1
Caelo	Salicylic acid	7466	1
Caelo	Salicylic acid	A-100513-1	1
Caelo	Salicylic acid	82732109	1
Caelo	Salicylic acid	Ch12134702	1
Fagron	Salicylic acid	RAS1135100	1
Fagron	Salicylic acid	RAS1135300	1
Fagron	Salicylic acid	xxxxxxxx	1

- 75 879 spectra from 463 *Apo-Ident* customers from a total of 25 265 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Salicylic acid* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Salicylic acid* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	200	0	72 233
Type B	0	410	0	161 663
Type C	0	1223	57	75 879

The substance/substance group *Salicylic acid* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 98.5366 %)
Type C	100.0000 % (> 99.8849 %)	95.5469 % (> 95.3125 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested

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reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20696	21906	4.59	74.08
21760	21906	1.53	72.61
21906	21906	0.00	72.03
22443	22443	0.00	68.38
23592	21906	2.76	70.73

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Selenium yeast**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20906-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Selenium yeast

Special notes

When selecting the *Selenium yeast* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Selenium yeast*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Selenium yeast	L1204012-01	20906	40	1403461
Caelo	Selenium yeast	13347911	21377	40	1509355
Caelo	Selenium yeast	17002202	23120	40	1707512
Caelo	Selenium yeast	173332	24038	40	20180207*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 4 reference samples from the substance/substance group *Selenium yeast*. These samples are listed above in the section *calibration samples*. The reference samples originate from 4 different batches.

- 72 273 spectra from a total of 1578 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 120 spectra from 3 reference samples of the substance/substance group *Selenium yeast*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Dr. Behr	Selenium yeast	P-07015253	20367	40
Euro OTC	Selenium yeast	L1401013-01	21102	40
Caelo	Selenium yeast	17002208	23446	40

- 161 953 spectra from a total of 3496 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 10 spectra from 4 *Apo-Ident* customers from 9 batches from the substance/substance group *Selenium yeast*.

- These include spectra of independent samples from 8 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caesar & Loretz GmbH, 4…	Selenium yeast	11318111	1
Caelo	Selenium yeast	12165708	1
Caelo	Selenium yeast	13347906	1
Caelo	Selenium yeast	13347911	1
Caelo	Selenium yeast	15276208	1
Euro OTC	Selenium yeast	L1210021-01	1
Euro OTC	Selenium yeast	L1503040-01	2
Euro OTC	Selenium yeast	L1404004-01	1
Euro OTC	Selenium yeast	L1401013-01	1

- 77 149 spectra from 463 *Apo-Ident* customers from a total of 25 538 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Selenium yeast* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Selenium yeast* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	72 273
Type B	0	80	40	161 853
Type C	0	8	2	77 144

The substance/substance group *Selenium yeast* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9928 %)	66.6667 % (> 64.1667 %)
Type C	100.0000 % (> 99.8853 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20906	20906	0.00	34.47
21377	21377	0.00	35.99
23120	23120	0.00	28.17
24038	24038	0.00	31.43

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Sildenafil citrate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20852-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Sildenafil citrate; Sildenafili citras

Special notes

When selecting the *Sildenafil citrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Sildenafil citrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Sildenafil citrate	13F24-N03	20852	40	1402052
Fagron	Sildenafil citrate	13J15-N01	20927	80	20131030
Euro OTC	Sildenafil citrate	1311010-01	21621	40	20131209
Caelo	Sildenafil citrate	160498	22446	40	20160307*
Caelo	Sildenafil citrate	170715	23336	40	20170529*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 240 spectra of 5 reference samples from the substance/substance group *Sildenafil citrate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 5 different batches.

- 72 193 spectra from a total of 1577 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 120 spectra from 4 reference samples of the substance/substance group *Sildenafil citrate*.

- These include spectra of independent samples from 1 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Sildenafil citrate	1311010-01	21621†	20
Caelo	Sildenafil citrate	160498	22446†	20
Euro OTC	Sildenafil citrate	1311010-04	23178	40
Caelo	Sildenafil citrate	170715	23345	40

- 161 953 spectra from a total of 3495 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 101 spectra from 32 *Apo-Ident* customers from 52 batches from the substance/substance group *Sildenafil citrate*.

- These include spectra of independent samples from 49 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Euro OTC	Sildenafil citrate	13110-01	1
Caelo	Sildenafil citrate	2101403	1
Polpharma/Phoenix	Sildenafil citrate	131101001	1
Euro OTC	Sildenafil citrate	1311010-01	3
Phönx/Polpharma	Sildenafil citrate	1311010-01	1
Gutenberg-Apotheke	Sildenafil citrate	1311010-01	1
Euro OTC	Sildenafil citrate	1311010-03	4
Euro OTC	Sildenafil citrate	131101003	1
Alliance	Sildenafil citrate	1311010-03	1
Caelo	Sildenafil citrate	131101003	1
Phoenix	Sildenafil citrate	1311010-04	2
Euro OTC	Sildenafil citrate	1311010-04	1
	Sildenafil citrate	1311010-04	2
Euro OTC	Sildenafil citrate	131101004	1
Euro OTC	Sildenafil citrate	1311010-05	1
Fagron	Sildenafil citrate	13J15-N01	3
Euro OTC	Sildenafil citrate	14051402	1
Caelo	Sildenafil citrate	14074703	2
Caelo	Sildenafil citrate	14074707	2
Caelo	Sildenafil citrate	14074709	1
Caelo	Sildenafil citrate	14074714	5
Caelo	Sildenafil citrate	14074710	1
Caelo	Sildenafil citrate	14074715	5
Caelo	Sildenafil citrate	14074716	1
Caelo	Sildenafil citrate	1407474	1
Fagron	Sildenafil citrate	14A08-b04-290225	1
Caelo	Sildenafil citrate	15097301	1
Fagron	Sildenafil citrate	14H11-B01-303183	1
Euro OTC	Sildenafil citrate	15097301	1
Caelo	Sildenafil citrate	15097303	1
Caelo	Sildenafil citrate	15097306	1
Caelo	Sildenafil citrate	15097307	2
Caelo	Sildenafil citrate	15097311	1
Caelo	Sildenafil citrate	15097312	2
Caelo	Sildenafil citrate	15097313	1
Caelo	Sildenafil citrate	15F11-B02-314725	1
Caelo	Sildenafil citrate	15097316	1
Fagron	Sildenafil citrate	15F11-B02-314725	1
Fagron	Sildenafil citrate	15F11-B02-320186	1
Fagron	Sildenafil citrate	15f11-b02-320186	1
Caelo	Sildenafil citrate	16049802	7
Gehe	Sildenafil citrate	16049805	1
Caelo	Sildenafil citrate	16049803	1

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Supplier	Substance	Batch	Spectra
Cealo	Sildenafil citrate	16049805	1
Caelo	Sildenafil citrate	16049808	3
Caelo	Sildenafil citrate	16049806	1
Sanacorp	Sildenafil citrate	16049811	2
Fagron	Sildenafil citrate	16049812	1
Caelo	Sildenafil citrate	16049814	3
Caelo	Sildenafil citrate	16049819	1
Fagron	Sildenafil citrate	16049819	2
Caelo	Sildenafil citrate	16049820	3
Caelo	Sildenafil citrate	16049821	2
Caelo	Sildenafil citrate	16049824	1
Fagron	Sildenafil citrate	16F30-B02-331450	3
Fagron	Sildenafil citrate	16F30-B02-324715	1
Euro OTC	Sildenafil citrate	17061405	1
Fagron	Sildenafil citrate	17071505	1
Euro OTC	Sildenafil citrate	17081504	1
Alliance	Sildenafil citrate		1
Gehe	Sildenafil citrate	13F24-N03	1
Caelo	Sildenafil citrate	45097306	1
Caelo	Sildenafil citrate	1311010-01	1

- 77 058 spectra from 463 *Apo-Ident* customers from a total of 25 495 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Sildenafil citrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Sildenafil citrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	240	0	72 193
Type B	0	120	0	161 953
Type C	0	101	0	77 058

The substance/substance group *Sildenafil citrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.5000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 95.0000 %)
Type C	100.0000 % (> 99.8850 %)	100.0000 % (> 94.0594 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to

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exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20852	20852	0.00	60.31
20927	20852	5.03	66.99
21621	20852	11.37	68.19
22446	22446	0.00	66.56
23336	23336	0.00	63.86

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Sodium acetate trihydrate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20984-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Sodium acetate trihydrate; Natrii acetas trihydricum; Natrii aceticum

Special notes

When selecting the *Sodium acetate trihydrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Sodium acetate trihydrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Sodium acetate t...	12316506	20984	40	1402111
Caelo	Sodium acetate t...	13411404	21441	40	20140113
Euro OTC	Sodium acetate t...	1507020	21861	40	20150723*
Caelo	Sodium acetate t...	172003	23812	40	20171107*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 4 reference samples from the substance/substance group *Sodium acetate trihydrate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 4 different batches.

- 72 273 spectra from a total of 1578 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 200 spectra from 6 reference samples of the substance/substance group *Sodium acetate trihydrate*.

- These include spectra of independent samples from 4 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
zu erfassen	Sodium acetate trihydrate	`zu erfassen`	20157	40
Caelo	Sodium acetate trihydrate	13411404	21441†	20
Euro OTC	Sodium acetate trihydrate	1507020	21861†	20
Caelo	Sodium acetate trihydrate	163007	22760	40
Euro OTC	Sodium acetate trihydrate	1608032	22802	40
Euro OTC	Sodium acetate trihydrate	1706008	23547	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 873 spectra from a total of 3494 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 40 spectra from 24 *Apo-Ident* customers from 22 batches from the substance/substance group *Sodium acetate trihydrate*.

- These include spectra of independent samples from 20 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Sodium acetate trihydrate	13295601	1
Caelo	Sodium acetate trihydrate	13411404	1
Euro OTC	Sodium acetate trihydrate	1005020V-01	1
Gehe	Sodium acetate trihydrate	13411412	3
Caelo	Sodium acetate trihydrate	13411418	2
Caelo	Sodium acetate trihydrate	15118701	3
Caelo	Sodium acetate trihydrate	151452009	1
Caelo	Sodium acetate trihydrate	15145204	7
Ebert KKH 13.10.16	Sodium acetate trihydrate	15145204	1
Caelo	Sodium acetate trihydrate	15145205	1
Caelo	Sodium acetate trihydrate	15145209	2
Ebert KKH 13.10.16	Sodium acetate trihydrate	15145209	1
Caelo	Sodium acetate trihydrate	16300706	1
Caelo	Sodium acetate trihydrate	16300705	1
Caelo	Sodium acetate trihydrate	16300711	1
Caelo	Sodium acetate trihydrate	16300712	1
Caelo	Sodium acetate trihydrate	10353017	1
Caelo	Sodium acetate trihydrate	12027202	3
Caelo	Sodium acetate trihydrate	12027203	1
Phönix Gotha	Sodium acetate trihydrate	12316506	1
Caelo	Sodium acetate trihydrate	12316506	1
Sanacorp	Sodium acetate trihydrate	13295601	1
Caelo	Sodium acetate trihydrate	12027211	1
Caelo	Sodium acetate trihydrate	12027217	1
Caelo	Sodium acetate trihydrate	12027228	1
Caelo	Sodium acetate trihydrate	13295606	1

- 77 119 spectra from 463 *Apo-Ident* customers from a total of 25 525 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Sodium acetate trihydrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this

purpose, all relevant spectra of the various substances were compared with *Sodium acetate trihydrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	160	0	72 273
Type B	0	183	17	161 873
Type C	0	40	0	77 119

The substance/substance group *Sodium acetate trihydrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9928 %)	91.5000 % (> 90.0000 %)
Type C	100.0000 % (> 99.8850 %)	100.0000 % (> 85.0000 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20984	20984	0.00	33.75
21441	20984	2.89	33.55
21861	21861	0.00	35.73
23812	23812	0.00	34.43

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Sodium ascorbate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20520-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Sodium ascorbate; Natrii ascorbas; Natrii ascorbinicum

Special notes

When selecting the *Sodium ascorbate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Sodium ascorbate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Sodium ascorbate	1406018-01	21583	40	1411165
Euro OTC	Sodium ascorbate	1507030	21853	40	20150811*
Euro OTC	Sodium ascorbate	1506018	21865	40	20150706*
Euro OTC	Sodium ascorbate	1510017	21946	40	20151102*
Euro OTC	Sodium ascorbate	1601007	22304	40	20160120*
Caelo	Sodium ascorbate	15429905	22899	40	20160118

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 240 spectra of 6 reference samples from the substance/substance group *Sodium ascorbate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 6 different batches.

- 72 193 spectra from a total of 1576 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 640 spectra from 18 reference samples of the substance/substance group *Sodium ascorbate*.

- These include spectra of independent samples from 12 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Sodium ascorbate	05061206	20520	40
Euro OTC	Sodium ascorbate	1406018-01	21583†	20
Euro OTC	Sodium ascorbate	1406018-01	21789	60
Euro OTC	Sodium ascorbate	1507030	21853†	20
Euro OTC	Sodium ascorbate	1506018	21865†	20
Euro OTC	Sodium ascorbate	1510017	21946†	20
Euro OTC	Sodium ascorbate	1601007	22304†	20
Euro OTC	Sodium ascorbate	1604001	22524	40
Euro OTC	Sodium ascorbate	1607044	22690	40
Caelo	Sodium ascorbate	162857	22761	40
Euro OTC	Sodium ascorbate	1611015	22864	40
Euro OTC	Sodium ascorbate	1701054	23134	40

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*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Sodium ascorbate	1703012	23152	40
Euro OTC	Sodium ascorbate	1705013	23430	40
Euro OTC	Sodium ascorbate	1705014	23432	40
Caelo	Sodium ascorbate	172235	23809	40
Caelo	Sodium ascorbate	180326	24029	40
Euro OTC	Sodium ascorbate	1803005	24069	40

- 161 433 spectra from a total of 3482 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 23 spectra from 7 *Apo-Ident* customers from 21 batches from the substance/substance group *Sodium ascorbate*.

- These include spectra of independent samples from 21 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Euro OTC	Sodium ascorbate	1210026-01	1
Euro OTC	Sodium ascorbate	L1308005-01	1
Euro OTC	Sodium ascorbate	11081401	1
Euro OTC	Sodium ascorbate	13031402	1
Euro OTC	Sodium ascorbate	12061407	1
Euro OTC	Sodium ascorbate	13051406	1
Caelo	Sodium ascorbate	14079404	1
Caelo	Sodium ascorbate	15180505	1
Caelo	Sodium ascorbate	1604001-01	2
Caelo	Sodium ascorbate	16285710	1
Euro OTC	Sodium ascorbate	170105401	1
Fagron	Sodium ascorbate	L1308005-01	1
Euro OTC	Sodium ascorbate	4021401	1
Euro OTC	Sodium ascorbate	7011405	1
Euro OTC	Sodium ascorbate	11121301	1
Fagron	Sodium ascorbate	12L27-N03	1
Fagron	Sodium ascorbate	13C15-N01	1
Euro OTC	Sodium ascorbate	20091303	1
Euro OTC	Sodium ascorbate	16091301	1
Caelo	Sodium ascorbate	27091302	1
Euro OTC	Sodium ascorbate	28081304	1
Caelo	Sodium ascorbate	L1210026-01	1

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

- 77 136 spectra from 463 *Apo-Ident* customers from a total of 25 526 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Sodium ascorbate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Sodium ascorbate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	240	0	72 193
Type B	0	637	3	161 433
Type C	0	23	0	77 136

The substance/substance group *Sodium ascorbate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.5000 %)
Type B	100.0000 % (> 99.9928 %)	99.5313 % (> 99.0625 %)
Type C	100.0000 % (> 99.8850 %)	100.0000 % (> 73.9130 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21583	21583	0.00	71.64
21853	21853	0.00	62.01
21865	21865	0.00	57.42
21946	21946	0.00	64.10
22304	22304	0.00	51.94
22899	22304	2.88	51.90

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Sodium benzoate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20479-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Sodium benzoate; Natrii benzoas; Natrii benzoicum

Special notes

When selecting the *Sodium benzoate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Sodium benzoate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Sodium benzoate	11267016	20752	40	20110923
Caelo	Sodium benzoate	13178619	21607	40	20130624
Euro OTC	Sodium benzoate	1409040-01	21713	40	20141021
Euro OTC	Sodium benzoate	1506019	21825	40	20150623*
Euro OTC	Sodium benzoate	1510044	22236	40	20151109*

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Sodium benzoate	1602020	22363	40	20160225*
Euro OTC	Sodium benzoate	1610037	22867	40	20161202*
Euro OTC	Sodium benzoate	1701045	22997	40	20170207*
Euro OTC	Sodium benzoate	1711019	23900	40	20171205*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 360 spectra of 9 reference samples from the substance/substance group *Sodium benzoate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 9 different batches.

- 72 073 spectra from a total of 1573 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 480 spectra from 14 reference samples of the substance/substance group *Sodium benzoate*.

- These include spectra of independent samples from 9 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Sodium benzoate	90834189	20191	40
Fagron	Sodium benzoate	10A08-N04	20479	40
Caelo	Sodium benzoate	13178619	21607†	20
Euro OTC	Sodium benzoate	1409040-01	21713†	20
Euro OTC	Sodium benzoate	1506019	21825†	20

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*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Sodium benzoate	1510044	22236†	20
Euro OTC	Sodium benzoate	1602020	22363†	20
Caelo	Sodium benzoate	161371	22474	60
Euro OTC	Sodium benzoate	1607005	22670	40
Fagron	Sodium benzoate	15B16-B07-308570	22895	40
Caelo	Sodium benzoate	170558	23283	40
Euro OTC	Sodium benzoate	1707024	23613	40
Caelo	Sodium benzoate	173530	23784	40
Euro OTC	Sodium benzoate	1803034	24068	40

- 161 593 spectra from a total of 3485 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 201 spectra from 129 *Apo-Ident* customers from 91 batches from the substance/substance group *Sodium benzoate*.

- These include spectra of independent samples from 88 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Euro OTC	Sodium benzoate	1304024-01	5
Caelo	Sodium benzoate	15044104	8
Euro OTC	Sodium benzoate	1506019-01	5
Euro OTC	Sodium benzoate	1510044-01	5
Caelo	Sodium benzoate	15363409	2
Caelo	Sodium benzoate	15363424	5
Caelo	Sodium benzoate	12158419	7
Caelo	Sodium benzoate	11267013	1
Caelo	Sodium benzoate	14166714	1
Caelo	Sodium benzoate	11267016	1
Caelo	Sodium benzoate	12158414	2
Fagron	Sodium benzoate	12H08-N06	2
Fagron	Sodium benzoate	13/27-B03-288805	1
Fagron	Sodium benzoate	13/27B03288805	1
Euro OTC	Sodium benzoate	1307013-01	2
Euro OTC	Sodium benzoate	1309027-01	2
EuroTOC / Noweda	Sodium benzoate	130902701	1
Caelo	Sodium benzoate	13178603	3
Caelo	Sodium benzoate	13178613	1
Caelo	Sodium benzoate	13178614	1
Caelo	Sodium benzoate	13178619	3
sana	Sodium benzoate	13178635	1

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†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Supplier	Substance	Batch	Spectra
Caelo	Sodium benzoate	13178635	4
Caelo	Sodium benzoate	13178643	1
Caelo	Sodium benzoate	13178647	2
Fagron	Sodium benzoate	13C14-NO1	1
Hedinger	Sodium benzoate	13I27-B03	1
Fagron	Sodium benzoate	13H01-N02	1
Fagron	Sodium benzoate	13F12-N11	1
Fagron	Sodium benzoate	13I27-B03-288806	3
Phoenix goettin	Sodium benzoate	13I27-B03-288806	1
Fagron	Sodium benzoate	13J27-B03	1
Fagron	Sodium benzoate	13127-B03-288806	1
Fagron	Sodium benzoate	13127-Bo3-288805	1
Euro OTC	Sodium benzoate	1404011-01	4
Euro/ Phönix	Sodium benzoate	1404011-01	1
Bombastus	Sodium benzoate	1404011-01	1
Unisan	Sodium benzoate	1404011-01	1
Euro OTC	Sodium benzoate	1409040-01	1
Fagron	Sodium benzoate	1412	1
Caelo	Sodium benzoate	14328702	1
Fagron	Sodium benzoate	14E12-B07	1
Fagron	Sodium benzoate	14E12B07296717	1
Fagron	Sodium benzoate	14E12Bo7296717	1
Fagron	Sodium benzoate	14E12BO7296717	1
Caelo	Sodium benzoate	1503022-01	1
Caelo	Sodium benzoate	15044102	6
Phönix	Sodium benzoate	1510044/01	1
Caelo	Sodium benzoate	15135001	6
Caelo	Sodium benzoate	15363401	10
Caelo	Sodium benzoate	15363402	1
Caelo	Sodium benzoate	15363413	1
Hedinger/Phönix	Sodium benzoate	15363413	1
Euro OTC	Sodium benzoate	15363424	1
Fagron	Sodium benzoate	15B16-B07-306571	2
Euro OTC	Sodium benzoate	1602020-01	2
Fagron	Sodium benzoate	1602020-01	1
Euro OTC	Sodium benzoate	1607005-01	2
Caelo	Sodium benzoate	1610037-01	1
Euro OTC	Sodium benzoate	1610037-01	1
Caelo	Sodium benzoate	16137103	3
Caelo	Sodium benzoate	16137112	1
Caelo	Sodium benzoate	16137113	1
Caelo	Sodium benzoate	16137118	2
Caelo	Sodium benzoate	17055805	1
Caelo	Sodium benzoate	17137606	1
Caelo	Sodium benzoate	2215Q-01891	1
Caelo	Sodium benzoate	24021501	1
Caelo	Sodium benzoate	4315A-01891	1
Caelo	Sodium benzoate	91443209	2
Caelo	Sodium benzoate	kdfhdf	1
Euro OTC	Sodium benzoate	1007019-01	1
Euro OTC	Sodium benzoate	1112006-01	1
EuRho	Sodium benzoate	1112006-01	1
Caelo	Sodium benzoate	11267007	2
Caelo	Sodium benzoate	11346113	1
Phönix 18.09.12	Sodium benzoate	1204011-01	2
Caelo	Sodium benzoate	1209018-0	1
Euro OTC	Sodium benzoate	1209018-01	6
Noweda	Sodium benzoate	1209018-01	1
Caelo	Sodium benzoate	12158401	1
Euro OTC	Sodium benzoate	1209018-18	1

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Supplier	Substance	Batch	Spectra
Anzag 19.11.2012	Sodium benzoate	12158402	1
Caelo	Sodium benzoate	12158418	1
Caelo	Sodium benzoate	12158439	3
Caelo	Sodium benzoate	12158424	1
Fagron	Sodium benzoate	1250	1
Fagron	Sodium benzoate	12C05-N04	1
Fagron	Sodium benzoate	12D02-N06	1
Fagron	Sodium benzoate	12G04-N04	1
Fagron	Sodium benzoate	12J23-N05	3
Phönix 04.03.2013	Sodium benzoate	12J23-N05	1
Phönix	Sodium benzoate	12J23-N05	2
Caelo	Sodium benzoate	12J23-N05	1
Fiebig 27.06.13 EK3,34	Sodium benzoate	1304024-01	1
EuRho Anzag	Sodium benzoate	1304024-01	1
Fagron	Sodium benzoate	1304024-01	1
Euro OTC	Sodium benzoate	130402401	2
Alliance Healthcare	Sodium benzoate	1304024-01	1
Caelo	Sodium benzoate	13178605	3
Caelo	Sodium benzoate	13178627	1
Fagron	Sodium benzoate	13C14-N01	4
Caelo	Sodium benzoate	17061306	1
Fagron	Sodium benzoate	1913A-01981	1
Fagron	Sodium benzoate	24011401	1
Euro OTC	Sodium benzoate	2604040V-05	1
Caelo	Sodium benzoate	5211I-01891	1
Caelo	Sodium benzoate	90834189	2
Fagron	Sodium benzoate	test	1

- 76 958 spectra from 463 *Apo-Ident* customers from a total of 25 457 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Sodium benzoate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Sodium benzoate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	360	0	72 073
Type B	0	474	6	161 593
Type C	0	198	3	76 958

The substance/substance group *Sodium benzoate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9887 %)	100.0000 % (> 98.3333 %)
Type B	100.0000 % (> 99.9928 %)	98.7500 % (> 98.1250 %)
Type C	100.0000 % (> 99.8850 %)	98.5075 % (> 97.0149 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20752	22363	7.46	26.03
21607	23900	4.21	28.20
21713	22236	7.12	31.69
21825	21825	0.00	21.18
22236	22236	0.00	25.36
22363	22363	0.00	33.11
22867	22867	0.00	32.98
22997	22997	0.00	34.14
23900	23900	0.00	40.35

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Sodium citrate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20662-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Sodium citrate; Natrii citras; Natrii citricum

Special notes

When selecting the *Sodium citrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Sodium citrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Sodium citrate	12E04-N05	20662	40	20120516
Caelo	Sodium citrate	12045026	20918	40	20120307
Caelo	Sodium citrate	13089335	21670	40	AR-15-FG-000405-01
Caelo	Sodium citrate	14112517	21718	40	20140416
Fagron	Sodium citrate	14A13-B02-294541	21778	40	20140424

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Sodium citrate	1506041	21839	40	0000010492
Euro OTC	Sodium citrate	1511017	21997	40	20151130*
Fagron	Sodium citrate	16F10-B01-326088	22843	40	20160711
Euro OTC	Sodium citrate	1610016	22859	40	20161102*
Euro OTC	Sodium citrate	1701029	22996	40	20170126*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 400 spectra of 10 reference samples from the substance/substance group *Sodium citrate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 10 different batches.

- 72 033 spectra from a total of 1572 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 380 spectra from 12 reference samples of the substance/substance group *Sodium citrate*.

- These include spectra of independent samples from 7 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Sodium citrate	1205026-01	20652	40
Caelo	Sodium citrate	12045008	20656	40
Caelo	Sodium citrate	13089335	21670†	20
Caelo	Sodium citrate	14112517	21718†	20

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*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Sodium citrate	14A13-B02-294541	21778†	20
Euro OTC	Sodium citrate	1506041	21839†	20
Euro OTC	Sodium citrate	1511017	21997†	20
Euro OTC	Sodium citrate	1604030	22510	40
Caelo	Sodium citrate	162179	22618	40
Euro OTC	Sodium citrate	1607040	22687	40
Euro OTC	Sodium citrate	1710006	23614	40
Caelo	Sodium citrate	173236	23789	40

- 161 693 spectra from a total of 3487 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 779 spectra from 290 *Apo-Ident* customers from 215 batches from the substance/substance group *Sodium citrate*.

- These include spectra of independent samples from 208 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Euro OTC	Sodium citrate	1305001-01	15
Euro OTC	Sodium citrate	1311035-01	22
Caelo	Sodium citrate	13089317	9
Fagron	Sodium citrate	13A07-N01	9
Caelo	Sodium citrate	14112518	3
Euro OTC	Sodium citrate	1412014-01	15
VDL;16.05.15;3,83EUR	Sodium citrate	14369406	1
Caelo	Sodium citrate	14369406	4
Caelo	Sodium citrate	14369407	31
Caelo	Sodium citrate	14369408	1
Caelo	Sodium citrate	14369413	12
Caelo	Sodium citrate	14369423	8
Euro OTC	Sodium citrate	1511017-01	15
Euro OTC	Sodium citrate	1506041-01	17
Caelo	Sodium citrate	16095702	3
Caelo	Sodium citrate	11219012	5
Caelo	Sodium citrate	11304311	5
Caelo	Sodium citrate	12045008	5
Caelo	Sodium citrate	12045011	7
Noweda	Sodium citrate	1205026-01	1
Euro OTC	Sodium citrate	1211030-01	12
Fagron	Sodium citrate	13B28-N02	5
Caelo	Sodium citrate	1234	3

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†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Supplier	Substance	Batch	Spectra
Caelo	Sodium citrate	12897	1
Fagron	Sodium citrate	13/24-B13-287921	4
Caelo	Sodium citrate	13089335	9
Fagron	Sodium citrate	13I24-B13-287921	2
Caelo	Sodium citrate	14112502	17
Caelo	Sodium citrate	14112504	2
Caelo	Sodium citrate	14112511	1
Caelo	Sodium citrate	14112517	8
Fagron	Sodium citrate	14A13b02300395	1
Caelo	Sodium citrate	12045016-3451311172	1
Fagron	Sodium citrate	1161207	4
Caelo	Sodium citrate	12045020	2
Caelo	Sodium citrate	12045024	6
Caelo	Sodium citrate	13089306	1
Caelo	Sodium citrate	12045026	9
Sanacorp	Sodium citrate	13089308	1
Caelo	Sodium citrate	13089309	4
Caelo	Sodium citrate	13089313	3
Herbasinica	Sodium citrate		2
Caelo	Sodium citrate	50815PMS01	1
Euro OTC	Sodium citrate		4
Euro OTC	Sodium citrate	815757/6745	1
fargon	Sodium citrate	100772-114-91	1
Fagron	Sodium citrate	815Q-01900	1
Gatt-Koller	Sodium citrate	1073/04121412	1
Caelo	Sodium citrate	1107011-02	2
Caelo	Sodium citrate	1042	1
Caelo	Sodium citrate	11081514	1
Caelo	Sodium citrate	1112517	1
Caelo	Sodium citrate	1123588946	1
Caelo	Sodium citrate	1151351	2
Caelo	Sodium citrate	1161207	2
Fagron	Sodium citrate	1172108	1
Fagron	Sodium citrate	1176767	3
Caesar/Noweda	Sodium citrate	12045008	2
Caesar&Loretz GmbH	Sodium citrate	12045026	1
Euro OTC	Sodium citrate	1205026-02	4
Fagron	Sodium citrate	1211142	1
Caelo	Sodium citrate		11
Euro OTC	Sodium citrate	12345	2
Caelo	Sodium citrate	123456	1
Caelo	Sodium citrate	123456789	1
Caelo	Sodium citrate	1234Test	1
Caelo	Sodium citrate	123658	1
Caelo	Sodium citrate	123Test	3
Caelo	Sodium citrate	123test	2
Caelo	Sodium citrate	1256825	1
Caelo	Sodium citrate	125874566	1
Fagron	Sodium citrate	12J26-N02	3
Caelo	Sodium citrate	128896	1
Caelo	Sodium citrate	13/24-B13-287921	1
Fargon/Alliance HC	Sodium citrate	13/24-B13-287921	1
Caelo	Sodium citrate	13089305	1
Caelo	Sodium citrate	13089308	8
Caelo	Sodium citrate	13089314	1
Caelo	Sodium citrate	13089318	1
Caelo	Sodium citrate	13089319	4
Caelo	Sodium citrate	13089325	3
Caelo	Sodium citrate	13089326	1
Caelo	Sodium citrate	13089331	9

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Supplier	Substance	Batch	Spectra
Sanacorp	Sodium citrate	13089331	1
Fagron	Sodium citrate	13089331	1
Bombastus	Sodium citrate	13089334	1
Caesar & Loretz GmbH	Sodium citrate	13089334	1
Caelo	Sodium citrate	13110350I	1
Sanacorp	Sodium citrate	1311035-01	1
Gehe	Sodium citrate	1311035-01	1
Caelo	Sodium citrate	1389318	1
Fagron	Sodium citrate	13A07-N01	1
Caelo	Sodium citrate	13B28-N02	3
Fagron	Sodium citrate	13D09-N01	5
Fagron	Sodium citrate	13E27-N12	1
Euro OTC	Sodium citrate	13I24-B13-287921	1
Euro OTC	Sodium citrate	1404033-01	12
Caelo	Sodium citrate	1404033-01	4
Euro OTC	Sodium citrate	140403301	5
EuRho	Sodium citrate	140403301	1
Gehe/Euro	Sodium citrate	1404033-01	2
Caelo	Sodium citrate	140510/1	1
Euro OTC	Sodium citrate	14112014-01	1
Fagron	Sodium citrate	14112502	1
Caesar&Loretz GmbH	Sodium citrate	14112502	1
Caesar & Loretz GmbH	Sodium citrate	14112517	1
Caelo	Sodium citrate	1411502	1
Caelo	Sodium citrate	14112520	1
Gehe/Euro	Sodium citrate	1412014-01	6
Euro OTC	Sodium citrate	1412014-0	1
EuRho	Sodium citrate	1412014-01	1
Fagron	Sodium citrate	1412014-01	1
Euro OTC	Sodium citrate	14201401	1
Sanacorp	Sodium citrate	1436407	1
Caelo	Sodium citrate	14369402	3
Caesar & Loretz GmbH	Sodium citrate	14369406	1
Caesar&Loretz GmbH/Anzag	Sodium citrate	14369407	1
Caelo	Sodium citrate	14369411	3
Caelo	Sodium citrate	14369414	1
Caelo	Sodium citrate	14369415	1
Phoenix 30.05.2016	Sodium citrate	14369423	1
Caelo	Sodium citrate	14369424	4
Caelo	Sodium citrate	14838	1
Fagron	Sodium citrate	14A13-B02	1
Noweda	Sodium citrate	14A13-B02-294541	1
Fagron	Sodium citrate	14A13-B02-294541	5
Fagron	Sodium citrate	14A13-B02-300395	4
Phoenix	Sodium citrate	1506041-01	2
Caelo	Sodium citrate	1506041-01	1
EuRho/Sanacorp	Sodium citrate	1506041-01	1
EuRho / Phoenix	Sodium citrate	151101017-01	1
Caelo	Sodium citrate	1511017-01	4
Euro OTC	Sodium citrate	151101701	1
Phoenix	Sodium citrate	1511017-01	2
Fagron	Sodium citrate	1511017-01	2
Euro OTC	Sodium citrate	15111017-01	1
Caelo	Sodium citrate	15212705	3
Caelo	Sodium citrate	154662	1
Euro OTC	Sodium citrate	156422	1
Fagron	Sodium citrate	15C27-B01-309893	1
Fagron	Sodium citrate	15c27-b01-321097	1
Fagron	Sodium citrate	15C27-B01-3211097	1
Fagron	Sodium citrate	15C27-B01-323451	1

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Supplier	Substance	Batch	Spectra
Euro OTC	Sodium citrate	160740-01	1
Euro OTC	Sodium citrate	16070-01	1
Euro OTC	Sodium citrate	1607040-01	6
Eurho/ Noweda	Sodium citrate	1607040-01	1
Caelo	Sodium citrate	1607040-01	1
EuRho	Sodium citrate	1607040-01	1
Caelo	Sodium citrate	16095707	1
Euro OTC	Sodium citrate	1610016-01	19
Caelo	Sodium citrate	1610016-01	1
Caelo	Sodium citrate	16217901	1
Caelo	Sodium citrate	16217902	1
Caelo	Sodium citrate	16217905	7
Caelo	Sodium citrate	16217909	1
Euro OTC	Sodium citrate	1645265	3
Fagron	Sodium citrate	16F10-B01-326088	1
Fargon GmbH & Co.KG	Sodium citrate	16F10-B01-326088	1
Caelo	Sodium citrate	16F10-B01-326093	1
Fagron	Sodium citrate	16F10-B01-327510	2
Euro OTC	Sodium citrate	1701029-01	5
Euro OTC	Sodium citrate	17061407	1
Caelo	Sodium citrate	17081501	1
Fagron	Sodium citrate	17A26-B04	1
Fagron	Sodium citrate	17A26-B04-331528	14
Caelo	Sodium citrate	17323601	1
Fagron	Sodium citrate	17A26-B04-332871	26
Fagron	Sodium citrate	17A26-B04-335680	24
Fagron	Sodium citrate	17H07-B04338530	28
Euro OTC	Sodium citrate	2114M1900	1
Caelo	Sodium citrate	220914PML01	1
Euro OTC	Sodium citrate	23062015C	1
Caelo	Sodium citrate	2345678	1
Caelo	Sodium citrate	2413A-01900	1
Euro OTC	Sodium citrate	25425	2
Euro OTC	Sodium citrate	2546426	1
Caelo	Sodium citrate	2815A-01900	1
Euro OTC	Sodium citrate	3032805	2
Euro OTC	Sodium citrate	3454	1
Euro OTC	Sodium citrate	345678	1
Caelo	Sodium citrate	459842	1
Bombastus	Sodium citrate	73155098	1
Caelo	Sodium citrate	4680	1
sanacorp	Sodium citrate	9/AKD12	1
Aug. Hedinger	Sodium citrate	8765456	1
Euro OTC	Sodium citrate	358528	1
Caelo	Sodium citrate	Test	1
Caelo	Sodium citrate	TestmessungnachRep	1
Caelo	Sodium citrate	70214PJK01	1
Caelo	Sodium citrate	713A-01900	1
Fagron	Sodium citrate	712A-01900	1
Euro OTC	Sodium citrate	1004010-01	1
anzag,12.12.12	Sodium citrate	1049088	1
Euro OTC	Sodium citrate	1073240	1
Euro OTC	Sodium citrate	1107011-01	1
Caelo	Sodium citrate	1107011-01	1
EuRho	Sodium citrate	1107011-02	1
EuRho/Sanacorp	Sodium citrate	1107011-02	1
Euro OTC	Sodium citrate	1107011-02	1
Caelo	Sodium citrate	1111111	1
Caelo	Sodium citrate	11121303	1
Noweda	Sodium citrate	11127001	1

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Supplier	Substance	Batch	Spectra
Caelo	Sodium citrate	11304305	1
Caelo	Sodium citrate	11304312	2
Caelo	Sodium citrate	12045001	2
Fagron	Sodium citrate	11L05-N01	1
Phönix 19.12.2012	Sodium citrate	12/10-N01	1
Test	Sodium citrate		1
Caelo	Sodium citrate	12045002	1
Caelo	Sodium citrate	12045004	3
Noweda	Sodium citrate	12045004	1
Caelo	Sodium citrate	12045007	1
Caelo	Sodium citrate	12045005	3
Caelo	Sodium citrate	12045006	1
Caelo	Sodium citrate	12045012	2
Caelo	Sodium citrate	12045016	5
Caelo	Sodium citrate	12045017	2
Caelo	Sodium citrate	12045019	6
Erika apotheke	Sodium citrate	12045020	1
Caelo	Sodium citrate	12045021	1
Noweda	Sodium citrate	12045026	1
Phönix/EuRho	Sodium citrate	1205026-02	1
Anzag	Sodium citrate	1205026-02	1
EuRho	Sodium citrate	1205026-02	1
Phönix	Sodium citrate	1205026-02	1
Gehe	Sodium citrate	1211030-01	1
Phönix	Sodium citrate	1211030-01	3
Alliance Healthcare	Sodium citrate	1211030-01	1
Caelo	Sodium citrate	121103001	1
Fagron	Sodium citrate	12339502	1
Test	Sodium citrate	1234	1
Fagron	Sodium citrate	1234567	1
Caelo	Sodium citrate	12345678	1
Fagron	Sodium citrate	12A05-N04	4
Fagron	Sodium citrate	12E04-N05	2
Fagron	Sodium citrate	12I10-N01	2
anzag, 14.12.2012	Sodium citrate	12l10-N06	1
Euro/Phönix	Sodium citrate	1305001-01	1
Caelo	Sodium citrate	13089304	3
Caelo	Sodium citrate	1308908	1
Europ Ots Pharma	Sodium citrate	13089304	1
Euro OTC	Sodium citrate	1311025-01	1
Caelo	Sodium citrate	13089329	1
Euro OTC	Sodium citrate	1413M-01900	1
Euro OTC	Sodium citrate	1521017-01	1
Euro OTC	Sodium citrate	20200810-6	1
Caelo	Sodium citrate	21121203	1
Euro OTC	Sodium citrate	22101305	1
Caelo	Sodium citrate	2213l-01900	1
Fagron	Sodium citrate	24121301	1
Caelo	Sodium citrate	25383143	1
fragon	Sodium citrate		1
Euro OTC	Sodium citrate	2903001-01	1
Euro OTC	Sodium citrate	30111301	1
Fagron	Sodium citrate	31051202	1
Fagron	Sodium citrate	3952/V06/15	1
Fagron	Sodium citrate	3311E-01900	1
Caelo	Sodium citrate	4111Q-01900	1
Caelo	Sodium citrate	4351235	1
EuRho	Sodium citrate	4611M-01900	1
Caelo	Sodium citrate	49131-01900	1
Phönix Gotha	Sodium citrate	52666276	1

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Supplier	Substance	Batch	Spectra
Caelo	Sodium citrate	8/AKD41	1
Caelo	Sodium citrate	K-280313-1	1
Fagron	Sodium citrate	Probe	1
Unisan	Sodium citrate	S/WReferenzUmstell	1
HiperScan	Sodium citrate		1
Fagron	Sodium citrate	14A13-B02-3003955	1
Caelo	Sodium citrate	15C27-B01-309893	1
Fagron	Sodium citrate	15C27-B01-312231	2
Fagron	Sodium citrate	15C27-B01-321097	1
Fagron	Sodium citrate	16F10-B01-323457	6
Fagron	Sodium citrate	15C27-B01-316106	1
Phönix	Sodium citrate	12045024	1
Caelo	Sodium citrate	1204521	1
Großhandel	Sodium citrate	12045026	1

- 76 380 spectra from 463 *Apo-Ident* customers from a total of 25 344 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Sodium citrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Sodium citrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	400	0	72 033
Type B	0	380	0	161 693
Type C	0	777	2	76 380

The substance/substance group *Sodium citrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9887 %)	100.0000 % (> 98.5000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 98.4211 %)
Type C	100.0000 % (> 99.8849 %)	99.7433 % (> 99.3582 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

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Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20662	21997	3.79	41.99
20918	21670	5.14	41.90
21670	21670	0.00	41.34
21718	21670	3.17	41.56
21778	21670	3.21	41.73
21839	21839	0.00	42.25
21997	21997	0.00	42.54
22843	21839	5.38	42.78
22859	22859	0.00	38.80
22996	22996	0.00	42.68

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Sodium cromoglicate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20775-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Sodium cromoglicate; Natrii cromoglicas; Natrii cromoglicinicum

Special notes

When selecting the *Sodium cromoglicate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Sodium cromoglicate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Sodium cromoglic…	12C09-N02	20775	79	1401553
Caelo	Sodium cromoglic…	11114501	20776	80	20110518
Fagron	Sodium cromoglic…	13G24-N04	21260	40	20130515
Caelo	Sodium cromoglic…	13232802	21375	20	1505352
Euro OTC	Sodium cromoglic…	1403017-01	21981	40	20140505

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Sodium cromoglic…	15224404	21990	40	20150625
Euro OTC	Sodium cromoglic…	1510018	22231	40	20151109*
Euro OTC	Sodium cromoglic…	1703027	23383	40	20170405*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 379 spectra of 8 reference samples from the substance/substance group *Sodium cromoglicate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 8 different batches.

- 72 054 spectra from a total of 1574 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 580 spectra from 13 reference samples of the substance/substance group *Sodium cromoglicate*.

- These include spectra of independent samples from 5 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Sodium cromoglicate	11114502	20289	40
Euro OTC	Sodium cromoglicate	1112003-01	20778	40
Caelo	Sodium cromoglicate	13232802	21376	100
Euro OTC	Sodium cromoglicate	1403017-01	21981†	20
Caelo	Sodium cromoglicate	15224404	21990†	20
Euro OTC	Sodium cromoglicate	1510018	22231†	20

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*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Sodium cromoglicate	15C23-B01-307751	22972	40
Caelo	Sodium cromoglicate	173081	23855	40
Euro OTC	Sodium cromoglicate	1711024	23871	40
Euro OTC	Sodium cromoglicate	1403017-01	21981SI	60
Caelo	Sodium cromoglicate	15224404	21990SI	60
Euro OTC	Sodium cromoglicate	1510018	22231SI	60
Fagron	Sodium cromoglicate	15C23-B01-307751	22972SI	40

- 161 493 spectra from a total of 3490 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 9 spectra from 7 *Apo-Ident* customers from 8 batches from the substance/substance group *Sodium cromoglicate*.

- These include spectra of independent samples from 5 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Sodium cromoglicate	13G24-N04	1
Caelo	Sodium cromoglicate	5113A-02831	1
Fagron	Sodium cromoglicate	12D26-N12	1
Fagron	Sodium cromoglicate	13E22-N11	1
Euro OTC	Sodium cromoglicate	1403017-01	1
Caelo	Sodium cromoglicate	15224404	1
Caelo	Sodium cromoglicate	12301101	2
Caelo	Sodium cromoglicate	12301102	1

- 77 150 spectra from 463 *Apo-Ident* customers from a total of 25 539 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Sodium cromoglicate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Sodium cromoglicate* and it was

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	378	1	72 054
Type B	0	537	43	161 493
Type C	0	8	1	77 150

The substance/substance group *Sodium cromoglicate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9887 %)	99.7361 % (> 98.9446 %)
Type B	100.0000 % (> 99.9928 %)	92.5862 % (> 92.0690 %)
Type C	100.0000 % (> 99.8851 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20775	20775	0.00	62.74
20776	22231	19.41	68.45
21260	22231	7.49	64.16
21375	21375	0.00	54.69
21981	22231	18.43	63.76
21990	22231	17.18	65.28
22231	22231	0.00	65.94
23383	23383	0.00	59.56

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Sodium cyclamate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20917-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Sodium cyclamate; Natrii cyclamas; Natrii cyclamicum

Special notes

When selecting the *Sodium cyclamate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Sodium cyclamate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Sodium cyclamate	12256803	20917	40	1401418
Caelo	Sodium cyclamate	12105622	21380	40	20120423

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 80 spectra of 2 reference samples from the substance/substance group *Sodium cyclamate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 2 different batches.

- 72 353 spectra from a total of 1580 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 140 spectra from 3 reference samples of the substance/substance group *Sodium cyclamate*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Sodium cyclamate	09350509	20137	60
Caelo	Sodium cyclamate	16119302	23259	40
Caelo	Sodium cyclamate	170411	23853	40

- 161 933 spectra from a total of 3496 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

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- 25 spectra from 16 *Apo-Ident* customers from 15 batches from the substance/substance group *Sodium cyclamate*.

- These include spectra of independent samples from 13 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Sodium cyclamate	13359807	1
Caelo	Sodium cyclamate	12105618	2
Caelo	Sodium cyclamate	12105613	1
Caelo	Sodium cyclamate	12256807	1
Phoenix	Sodium cyclamate	787/03100611	1
Caesar & Loretz GmbH	Sodium cyclamate	12105622	1
Caelo	Sodium cyclamate	12105622	1
Caelo	Sodium cyclamate	15201601	2
Caelo	Sodium cyclamate	15201606	1
Caelo	Sodium cyclamate	15201608	1
Euro OTC	Sodium cyclamate	16119302	1
Caelo	Sodium cyclamate	16119302	3
Caelo	Sodium cyclamate	16119308	2
Caelo	Sodium cyclamate	17041102	2
Caelo	Sodium cyclamate	10380915	2
Caelo	Sodium cyclamate	11204205	1
anzag,13.12.12	Sodium cyclamate	12256803	1
Caelo	Sodium cyclamate	12256803	1

- 77 134 spectra from 463 *Apo-Ident* customers from a total of 25 532 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Sodium cyclamate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Sodium cyclamate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	80	0	72 353
Type B	0	130	10	161 933
Type C	0	23	2	77 134

The substance/substance group *Sodium cyclamate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9928 %)	92.8571 % (> 90.7143 %)
Type C	100.0000 % (> 99.8850 %)	92.0000 % (> 80.0000 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20917	20917	0.00	80.53
21380	20917	13.05	80.86

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Sodium edetate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20937-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Sodium edetate; Dinatrii edetas; Natrii aethylendiaminum tetraaceticum

Special notes

When selecting the *Sodium edetate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Sodium edetate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Sodium edetate	13E15-N05	20937	40	1402193
Caelo	Sodium edetate	13142009	21362	40	20130524
Caelo	Sodium edetate	161364	22465	40	20160504*
Euro OTC	Sodium edetate	1609023	22915	40	20170106*
Fagron	Sodium edetate	16F21-B02-325085	22926	40	20160713

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 200 spectra of 5 reference samples from the substance/substance group *Sodium edetate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 5 different batches.

- 72 233 spectra from a total of 1577 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 233 spectra from 7 reference samples of the substance/substance group *Sodium edetate*.

- These include spectra of independent samples from 5 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Sodium edetate	10C10-N04	20190	40
Caelo	Sodium edetate	161364	22465†	20
Euro OTC	Sodium edetate	1609023-01	22950	40
Euro OTC	Sodium edetate	1704011	23390	40
Caelo	Sodium edetate	172618	23663	40
Caelo	Sodium edetate	172618	23818	40
Caelo	Sodium edetate	15427714	not required	13

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 840 spectra from a total of 3493 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 296 spectra from 170 *Apo-Ident* customers from 95 batches from the substance/substance group *Sodium edetate*.

- These include spectra of independent samples from 92 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Euro OTC	Sodium edetate	13142018	1
Fagron	Sodium edetate	13K19-B02-290051	8
Caelo	Sodium edetate	15116603	12
Caelo	Sodium edetate	15427703	5
Caelo	Sodium edetate	15427717	7
Fagron	Sodium edetate	601EB174	1
Fagron	Sodium edetate	16F21-B02-323069	1
GEHE	Sodium edetate	11074702	1
Caelo	Sodium edetate	12181714	3
Caelo	Sodium edetate	12E16-N04	1
Fagron	Sodium edetate	914E-01925	1
Fagron	Sodium edetate	13K19-B02	2
Fagron	Sodium edetate	13I23-N03	9
Fagron	Sodium edetate	601HA062	4
Fagron	Sodium edetate	13k19-b02-290051	2
Caelo	Sodium edetate	12181711	13
Caelo	Sodium edetate	13142004	4
Caelo	Sodium edetate	13/23-N03-3472312131	1
Caelo	Sodium edetate	13142008	8
Fagro/Gehe	Sodium edetate	601H1300	1
Caelo	Sodium edetate	11074608	2
Caelo	Sodium edetate	13142002	4
Caelo	Sodium edetate	13142009	9
Caelo	Sodium edetate	13142010	3
Caelo	Sodium edetate	13142014	1
Caelo	Sodium edetate	13142015	6
phönix	Sodium edetate	13142018	1
Caelo	Sodium edetate	13142018	1
Gehe	Sodium edetate	13142018	1
Caelo	Sodium edetate	13395002	3
Caelo	Sodium edetate	13395007	5
phönix	Sodium edetate	13K19-B02-290051	1
Caelo	Sodium edetate	13K19-B02-290051	1
Fagron	Sodium edetate	13K19-B02-290052	3
Caelo	Sodium edetate	14270505	3
phönix	Sodium edetate	15427703	1
Caelo	Sodium edetate	14270506	4
Caelo	Sodium edetate	15427714	6
Fagron	Sodium edetate	16F21-B02-324370	4
Nachprüfung	Sodium edetate	601HA062	2
Caelo	Sodium edetate	2101414	1

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Supplier	Substance	Batch	Spectra
Fagron	Sodium edetate	215I-01925	1
Caelo	Sodium edetate	12181702	1
Caelo	Sodium edetate	12G25-N12	1
Fagron	Sodium edetate	13/23-N03	5
Phönix	Sodium edetate	13E15-B10	1
Fagron	Sodium edetate	13E15-B10-289034	1
Fagron	Sodium edetate	13E15-N05	10
Caelo	Sodium edetate	13E15-N05	5
Fagron	Sodium edetate	13G15-N03	4
Phönix	Sodium edetate	13G15-N03	1
Phoenix Goettin	Sodium edetate	13G15-N03	1
Phoenix Goettin	Sodium edetate	13G15-NO3	1
Fagron	Sodium edetate	13I23-NO3	1
Fagron	Sodium edetate	13K19B02	1
Fagron	Sodium edetate	13K19-B02-289035	1
Anzag	Sodium edetate	13K19-B02-290051	1
Fagron	Sodium edetate	13K19B02290051	1
Fagron	Sodium edetate	13K-19-B02-290051	1
Caesar & Loretz GmbH	Sodium edetate	14270505	1
Caelo	Sodium edetate	1427006	1
Caelo	Sodium edetate		1
Fagron	Sodium edetate	14G03-B05	5
Fagron	Sodium edetate	14G03-B05307737	1
Fagron	Sodium edetate	14G03-B05-307737	5
Caelo	Sodium edetate	14G03-B05-307737	1
Fagron	Sodium edetate	14G03B05309971	1
Fagron	Sodium edetate	14G03-B05-309971	1
Caelo	Sodium edetate	15035603	2
Caelo	Sodium edetate	15035604	5
Caelo	Sodium edetate	15116602	4
Sanacorp	Sodium edetate	1505603	1
Caelo	Sodium edetate	1517E-01925	1
Caelo	Sodium edetate	15427704	2
Phoenix	Sodium edetate	15427704	1
phönix	Sodium edetate	15427704	1
Caelo	Sodium edetate	15427705	3
Caesar & Loretz GmbH	Sodium edetate	15427705	1
Caelo	Sodium edetate	15427710	1
Caelo	Sodium edetate	16337302	3
Bombastus	Sodium edetate	16136404	1
Fagron	Sodium edetate	15D01-B05-315877	2
Caelo	Sodium edetate	16337312	3
sanacorp	Sodium edetate	16F21-B02-324370	1
Fagron	Sodium edetate	16F21-B02-325085	1
Fagron	Sodium edetate	16F21-B02-327696	1
Fagron	Sodium edetate	16F21-B02-329900	1
Fagron	Sodium edetate	17D25-B08-334827	1
Fagron	Sodium edetate	4114Q-01925	1
Fagron	Sodium edetate	5315A-01925	1
Fagron	Sodium edetate	813Q-01925	1
Phönix	Sodium edetate	11074702	1
Caelo	Sodium edetate	11074611	1
phönix, 19.12.2012	Sodium edetate	11L13-N02	1
Fagron	Sodium edetate	11L13-NO2	1
Caelo	Sodium edetate	11074703	1
Cranach-Apotheke	Sodium edetate	11a31-no6	1
Caelo	Sodium edetate	12181703	3
Caelo	Sodium edetate	12181704	1
Caelo	Sodium edetate	12181706	3
Heidelberger/Noweda	Sodium edetate	12181711	1

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Supplier	Substance	Batch	Spectra
Alliance Healthcare	Sodium edetate	12181714	1
Caelo	Sodium edetate	12254507	3
Fagron	Sodium edetate	12E16-N04	2
Sanacorp	Sodium edetate	12G25-N12	2
Fagron	Sodium edetate	12G25-N12	5
Fagron	Sodium edetate	12g25-n12	1
Anzag, 24.10.2012	Sodium edetate	12G25-W12	1
	Sodium edetate	13142009	1
sanacorp	Sodium edetate	13E15-N05	1
Phönix	Sodium edetate	13E15-N05	3
Gehe	Sodium edetate	13E15-N05	1
Sanacorp	Sodium edetate	13E15-N05	1
Fagron	Sodium edetate	13E15-N05	2
Caelo	Sodium edetate	13E15-N05	1
Fagron	Sodium edetate	14G03-B05-30773	1
Caelo	Sodium edetate	3211I-01925	1
Caelo	Sodium edetate	2913M1925	1
Sanacorp	Sodium edetate	6/AKD14	1
Fagron	Sodium edetate	601H1167	1
Fagron	Sodium edetate	601H1300	2
Gehe	Sodium edetate	601H1300	1
Noweda	Sodium edetate	601H1300	1
Caesar & Loretz GmbH, 4...	Sodium edetate	12181711	1
Fagron	Sodium edetate	12E12-N04	1
Phönix	Sodium edetate	13142004	1
Caesar & Loretz GmbH	Sodium edetate	13142008	1
Fagron	Sodium edetate	13E15-No5	1
Fagron	Sodium edetate	5012Q-01925	1
Caelo	Sodium edetate	92159379	1

- 76 863 spectra from 463 *Apo-Ident* customers from a total of 25 453 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Sodium edetate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Sodium edetate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	200	0	72 233
Type B	0	233	0	161 840
Type C	0	295	1	76 863

The substance/substance group *Sodium edetate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 97.4249 %)
Type C	100.0000 % (> 99.8850 %)	99.6622 % (> 98.6486 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20937	20937	0.00	68.88
21362	22915	4.47	70.75
22465	22465	0.00	73.02
22915	22915	0.00	72.47
22926	22915	4.63	69.26

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Sodium methyl-4-hydroxybenzoate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	22602-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Sodium methyl-4-hydroxybenzoate; Methylis parahydroxybenzoas natricus; Natrium methylparahydroxybenzoicum

Special notes

When selecting the *Sodium methyl-4-hydroxybenzoate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Sodium methyl-4-hydroxybenzoate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Sodium methyl-4-...	15358708	22602	40	AR-16-FG-015095-01
Caelo	Sodium methyl-4-...	15358713	23093	40	20151127
Caelo	Sodium methyl-4-...	170519	23289	40	20170308*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Sodium methyl-4-hydroxybenzoate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 80 spectra from 2 reference samples of the substance/substance group *Sodium methyl-4-hydroxybenzoate*.

- These include spectra of independent samples from 1 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Sodium methyl-4-hydroxybenzo…	15358708	22603	40
Caelo	Sodium methyl-4-hydroxybenzo…	15358709	22776	40

- 161 993 spectra from a total of 3497 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 0 spectra from 0 *Apo-Ident* customers from 0 batches from the substance/substance group *Sodium methyl-4-hydroxybenzoate*.

- These include spectra of independent samples from 0 batches, of which no spectra have been used for the generation of the database.

- 77 159 spectra from 463 *Apo-Ident* customers from a total of 25 547 batches from a further 701 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Sodium methyl-4-hydroxybenzoate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Sodium methyl-4--hydroxybenzoate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	80	0	161 993
Type C	0	0	0	77 159

The substance/substance group *Sodium methyl-4-hydroxybenzoate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 92.5000 %)
Type C	100.0000 % (> 99.8849 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
22602	22602	0.00	47.21
23093	23289	8.51	46.59
23289	23289	0.00	47.27

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Sodium salicylate, powdered**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	21037-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Sodium salicylate, powdered; Natrii salicylas plv.; Natrii salicylicum plv.

Special notes

When selecting the *Sodium salicylate, powdered* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Sodium salicylate, powdered*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Sodium salicylat…	12158307	21037	40	1403225
Caelo	Sodium salicylat…	13140513	21689	40	20130531
Caelo	Sodium salicylat…	163053	23052	40	20161118*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Sodium salicylate, powdered*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 100 spectra from 3 reference samples of the substance/substance group *Sodium salicylate, powdered*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Sodium salicylate, powdered	10176004	20284	40
Caelo	Sodium salicylate, powdered	13140513	21689†	20
Caelo	Sodium salicylate, powdered	16305301	22879	40

- 161 973 spectra from a total of 3496 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 5 spectra from 5 *Apo-Ident* customers from 5 batches from the substance/substance group *Sodium salicylate, powdered.*

- These include spectra of independent samples from 5 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Sodium salicylate, powdered	102091210	1
Phoenix	Sodium salicylate, powdered	12158309	1
Fagron	Sodium salicylate, powdered	13G08-N07	1
Caelo	Sodium salicylate, powdered	18061305	1
GATT-KOLLER/PHOENIX	Sodium salicylate, powdered	4853/11124512	1

- 77 154 spectra from 463 *Apo-Ident* customers from a total of 25 542 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Sodium salicylate, powdered* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Sodium salicylate, powdered* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	100	0	161 973
Type C	0	5	0	77 154

The substance/substance group *Sodium salicylate, powdered* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 94.0000 %)
Type C	100.0000 % (> 99.8852 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21037	21037	0.00	87.57
21689	21037	8.49	88.56
23052	23052	0.00	85.24

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Sodium tetraborate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20179-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Sodium tetraborate; Borax; Natrii tetraboricum

Special notes

When selecting the *Sodium tetraborate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Sodium tetraborate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Sodium tetraborate	13290118	21438	40	1412042
Euro OTC	Sodium tetraborate	1404025-01	21656	40	20140514
Euro OTC	Sodium tetraborate	1507024	21854	40	20150730*
Euro OTC	Sodium tetraborate	1510032	22235	40	20151118*
Caelo	Sodium tetraborate	161372	22475	40	20160624*
Euro OTC	Sodium tetraborate	1711002	23892	40	20171128*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 240 spectra of 6 reference samples from the substance/substance group *Sodium tetraborate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 6 different batches.

- 72 193 spectra from a total of 1576 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 350 spectra from 11 reference samples of the substance/substance group *Sodium tetraborate*.

- These include spectra of independent samples from 5 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Sodium tetraborate	2905009-02	20179	50
Caelo	Sodium tetraborate	13290118	21438†	20
Euro OTC	Sodium tetraborate	1404025-01	21656†	20
Euro OTC	Sodium tetraborate	1507024	21854†	20
Euro OTC	Sodium tetraborate	1510032	22235†	20
Caelo	Sodium tetraborate	161372	22475†	20
Euro OTC	Sodium tetraborate	1603043	22508	40
Caelo	Sodium tetraborate	161372	22621	40
Euro OTC	Sodium tetraborate	1607036	22713	40
Euro OTC	Sodium tetraborate	1701046	22990	40
Euro OTC	Sodium tetraborate	1804014	24093	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*).

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- 161 723 spectra from a total of 3489 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 32 spectra from 21 *Apo-Ident* customers from 21 batches from the substance/substance group *Sodium tetraborate*.

- These include spectra of independent samples from 19 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Sodium tetraborate	11369431	1
Caelo	Sodium tetraborate	21051402	1
Caelo	Sodium tetraborate	13290118	1
Caelo	Sodium tetraborate	14310905	2
Caelo	Sodium tetraborate	1309032-01	1
Euro OTC	Sodium tetraborate	1404025-01	4
Euro OTC	Sodium tetraborate	1408006-01	3
Productos Quimicos	Sodium tetraborate	16000597	1
Euro OTC	Sodium tetraborate	1402002-01	2
Borax Francais	Sodium tetraborate	1402002-01	1
Phoenix	Sodium tetraborate	1603043-01	1
Euro OTC	Sodium tetraborate	1507024-01	3
Euro OTC	Sodium tetraborate	1503043-01	1
Euro OTC	Sodium tetraborate	160304301	1
Euro OTC	Sodium tetraborate	1607036-01	1
Caelo	Sodium tetraborate	16137201	1
Euro OTC	Sodium tetraborate	1701046-01	1
Fagron	Sodium tetraborate	12H09-N03	1
Euro OTC	Sodium tetraborate	1302034-01	1
Euro OTC	Sodium tetraborate	130203401	1
Euro OTC	Sodium tetraborate	1309032-01	1
Gatt-Koller / Phoenix	Sodium tetraborate	6187/01142114	1
Euro OTC	Sodium tetraborate	13111207	1

- 77 127 spectra from 463 *Apo-Ident* customers from a total of 25 528 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Hence, these spectra are not independent and are not of *Type B*.

Validation results

The validation runs checked whether the substance/substance group *Sodium tetraborate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Sodium tetraborate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	236	4	72 193
Type B	0	341	9	161 723
Type C	0	32	0	77 127

The substance/substance group *Sodium tetraborate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	98.3333 % (> 97.0833 %)
Type B	100.0000 % (> 99.9928 %)	97.4286 % (> 96.5714 %)
Type C	100.0000 % (> 99.8850 %)	100.0000 % (> 81.2500 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21438	21438	0.00	44.53
21656	21438	6.84	45.61
21854	21854	0.00	45.74
22235	22235	0.00	44.92
22475	22475	0.00	46.53
23892	23892	0.00	42.85

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Sorbic acid**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20881-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Sorbic acid; Acidum sorbicum; Acidum sorbinicum

Special notes

When selecting the *Sorbic acid* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Sorbic acid*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Sorbic acid	12038025	20881	40	20120315
Caelo	Sorbic acid	13334008	21460	40	AR-15-FG-007849-01
Caelo	Sorbic acid	14176214	22592	40	20140708
Caelo	Sorbic acid	15382002	22826	40	20151112
Caelo	Sorbic acid	162080	23859	40	20160722*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 200 spectra of 5 reference samples from the substance/substance group *Sorbic acid*. These samples are listed above in the section *calibration samples*. The reference samples originate from 5 different batches.

- 72 233 spectra from a total of 1577 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 140 spectra from 4 reference samples of the substance/substance group *Sorbic acid*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Sorbic acid	13334008	21460†	20
Caelo	Sorbic acid	14380714	22593	40
Caelo	Sorbic acid	162080	22616	40
Caelo	Sorbic acid	172056	23851	40

- 161 933 spectra from a total of 3495 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 190 spectra from 122 *Apo-Ident* customers from 56 batches from the substance/substance group *Sorbic acid*.

- These include spectra of independent samples from 52 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
VDL;5,78EUR;18.12	Sorbic acid	14176206	1
Caelo	Sorbic acid	13334008	5
Caelo	Sorbic acid	14176206	9
vdl 28.04.2014 preis:5,79	Sorbic acid		1
Caelo	Sorbic acid	14176209	4
Caelo	Sorbic acid	14176214	8
Caelo	Sorbic acid	12330618	13
Caelo	Sorbic acid	12330608	9
Caelo	Sorbic acid	4811Q-01048	1
Caelo	Sorbic acid	12038025	1
Caelo	Sorbic acid	12038016	6
Caelo	Sorbic acid	12038003	3
Fagron	Sorbic acid	12330618	1
Caelo	Sorbic acid	13334003	4
PHOENIX 12.05.2014	Sorbic acid	13334008	1
Caelo	Sorbic acid	13334010	8
Fagron	Sorbic acid	13334008	1
Caelo	Sorbic acid	13334015	1
Fagron	Sorbic acid	14176206	1
Caelo	Sorbic acid	14176207	1
Noweda	Sorbic acid	14176206	1
Caelo	Sorbic acid	14176212	6
Caelo	Sorbic acid	14176213	1
Caelo	Sorbic acid	14380702	3
Caelo	Sorbic acid	14380704	1
Caelo	Sorbic acid	14380706	4
Caelo	Sorbic acid	14380707	1
Caelo	Sorbic acid	14380713	2
Caelo	Sorbic acid	14380714	6
phönix	Sorbic acid	15382010	1
Caelo	Sorbic acid	16208015	2
Gatt-Koller / Phoenix	Sorbic acid	2575/07142914	1
Noweda	Sorbic acid	14380706	1
Caesar & Loretz/Noweda	Sorbic acid	14380706	1
Caelo	Sorbic acid	15382001	1
Caelo	Sorbic acid	15382002	5
Caelo	Sorbic acid	15382007	3
Caelo	Sorbic acid	15382010	5
Caelo	Sorbic acid	16208005	9
Caelo	Sorbic acid	16208009	3
Caelo	Sorbic acid	16208011	1
Caelo	Sorbic acid	16208012	2
Caelo	Sorbic acid	16208020	1

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Supplier	Substance	Batch	Spectra
Caelo	Sorbic acid	1620808005	1
Caelo	Sorbic acid	162508016	1
Euro OTC	Sorbic acid	o216E-01048	1
Caelo	Sorbic acid	10305208	1
Caelo	Sorbic acid	213E-01048	1
Finze	Sorbic acid	9280207	1
Caelo	Sorbic acid	10305209	1
Caelo	Sorbic acid	10120303	1
Caelo	Sorbic acid	9280207	1
Caelo	Sorbic acid	10305213	2
Caelo	Sorbic acid	105505	1
Caelo	Sorbic acid	11203806	3
Caelo	Sorbic acid	11203807	11
Phoenix	Sorbic acid	11203813	1
Caelo	Sorbic acid	11203812	1
Phönix	Sorbic acid	1171	1
Caelo	Sorbic acid	12038002	2
Caelo	Sorbic acid	12038009	1
Caelo	Sorbic acid	12038012	1
Sanacorp	Sorbic acid	12038016	1
Anzag	Sorbic acid	12038016	1
Caelo	Sorbic acid	12038020	6
Noweda	Sorbic acid	12038020	1
Noweda	Sorbic acid	12038016	1
Euro OTC	Sorbic acid	12038020	1
Fagron	Sorbic acid	121394	1
Noweda	Sorbic acid	12330608	1
Phönix	Sorbic acid	12330618	1
Sanacorp	Sorbic acid	13334008	1
Caelo	Sorbic acid	29071201	1
Caelo	Sorbic acid	5012E-01048	1

- 76 969 spectra from 463 *Apo-Ident* customers from a total of 25 491 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Sorbic acid* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Sorbic acid* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	200	0	72 233
Type B	0	140	0	161 933
Type C	0	154	36	76 969

The substance/substance group *Sorbic acid* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

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	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 95.7143 %)
Type C	100.0000 % (> 99.8850 %)	81.0526 % (> 79.4737 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20881	23859	4.73	49.99
21460	21460	0.00	49.78
22592	23859	4.18	50.94
22826	23859	5.94	48.73
23859	23859	0.00	49.51

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Sorbitol**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20075-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Sorbitol; Sorbitolum

Special notes

When selecting the *Sorbitol* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Sorbitol*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Sorbitol	13278217	21485	40	20130920
Euro OTC	Sorbitol	1506052	21834	40	20150713*
Euro OTC	Sorbitol	1512016	22293	40	20160113*
Euro OTC	Sorbitol	1604007	22539	40	20160428*
Caelo	Sorbitol	16038501	22847	40	20160315
Euro OTC	Sorbitol	1610018	22849	40	20161121*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 240 spectra of 6 reference samples from the substance/substance group *Sorbitol*. These samples are listed above in the section *calibration samples*. The reference samples originate from 6 different batches.

- 72 193 spectra from a total of 1576 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 205 spectra from 6 reference samples of the substance/substance group *Sorbitol*.

- These include spectra of independent samples from 4 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Sorbitol	91992409	20075	45
Caelo	Sorbitol	11379309	20499	40
Euro OTC	Sorbitol	1506052	21834†	20
Euro OTC	Sorbitol	1512016	22293†	20
Caelo	Sorbitol	163531	23028	40
Caelo	Sorbitol	16353107	23442	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 868 spectra from a total of 3493 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 158 spectra from 57 *Apo-Ident* customers from 89 batches from the substance/substance group *Sorbitol*.

- These include spectra of independent samples from 87 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Sorbitol	5021307	1
Caelo	Sorbitol	11379336	2
Fagron	Sorbitol		1
Caelo	Sorbitol	13278241	1
Fagron	Sorbitol	12J15-N01	1
Fagron	Sorbitol	12L17-N12	3
Caelo	Sorbitol	13278216	3
Gehe 01.09.2014	Sorbitol	13278217	1
Caelo	Sorbitol	13278249	1
Caelo	Sorbitol	13278250	1
Caelo	Sorbitol	13335307	3
Fagron	Sorbitol	13D08-N27	1
Caelo	Sorbitol	14250807	1
Caelo	Sorbitol	15118901	6
Caelo	Sorbitol	15208310	4
Caelo	Sorbitol	16038515	4
Euro OTC	Sorbitol	1604007-01	3
Caelo	Sorbitol	16101303	1
Caelo	Sorbitol	22011305	1
Fagron	Sorbitol	M721140/12L17-N12	1
Caelo	Sorbitol	4091401	1
Phönix Gotha	Sorbitol	10383330	1
Caelo	Sorbitol	8081402	1
Caelo	Sorbitol	1083330	2
Phönix 05.11.2012	Sorbitol	1112010-01	1
Caelo	Sorbitol	11379320	1
Caelo	Sorbitol	11379321	1
Caelo	Sorbitol	11379322	1
Phönix Gotha	Sorbitol	11379332	1
Caelo	Sorbitol	11379332	3
Caelo	Sorbitol	11379337	2
Fagron	Sorbitol	11I09-N11	1
Caelo	Sorbitol	12249108	2
Phoenix 12.08.2013	Sorbitol	12249108	1
Caelo	Sorbitol	12249109	2
Caelo	Sorbitol	12249110	4
Caelo	Sorbitol	12249124	2
Caelo	Sorbitol	12249126	2
Caelo	Sorbitol	12249139	1
Caelo	Sorbitol	12249140	1
Caelo	Sorbitol		1

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Supplier	Substance	Batch	Spectra
Caelo	Sorbitol	12345	1
Fagron	Sorbitol	12E30-N24	5
Caelo	Sorbitol	12L07-N12	1
Euro OTC	Sorbitol	1301019-01	2
eurho	Sorbitol	1301019-01	1
Caelo	Sorbitol	13278204	1
Euro OTC	Sorbitol	1311034-01	1
Bombastus	Sorbitol	13278206	2
Caelo	Sorbitol	13278206	1
Caelo	Sorbitol	13278218	1
Caelo	Sorbitol	13278239	1
Caelo	Sorbitol	13278246	3
GEHE 28.11.2014	Sorbitol	13278245	1
Caelo	Sorbitol	13278247	1
Fagron	Sorbitol	13278249	1
Caelo	Sorbitol	133335307	1
Caelo	Sorbitol	13335304	2
Merck	Sorbitol	13D08-N27	1
Fagron	Sorbitol	13E07-B40	2
Gehe	Sorbitol	1404007-01	1
Fagron	Sorbitol	13G04-N04	1
Euro OTC	Sorbitol	1404007-01	4
Caelo	Sorbitol	14250806	1
Caelo	Sorbitol	14250808	1
Euro OTC	Sorbitol	1501048-01	3
Fagron	Sorbitol	14E21-B02	1
Caelo	Sorbitol	15012708	1
Euro OTC	Sorbitol	1506052-01	4
Caelo	Sorbitol	15118902	2
Caelo	Sorbitol	15118912	1
Euro OTC	Sorbitol	1512016-01	1
Caelo	Sorbitol	15208302	2
Caelo	Sorbitol	15208305	3
Caelo	Sorbitol	15208303	1
Caelo	Sorbitol	15208306	1
Caelo	Sorbitol	15208309	2
Caelo	Sorbitol	15208311	3
Caelo	Sorbitol	16038501	3
Caelo	Sorbitol	16038503	1
Caelo	Sorbitol	16038514	3
Euro OTC	Sorbitol	1610018-01	1
Caelo	Sorbitol	16353102	2
Gatt-Koller / Phoenix	Sorbitol	1718/0513	1
Caelo	Sorbitol	17011305	1
Caelo	Sorbitol	20021501	1
Caelo	Sorbitol	23081401	1
Caelo	Sorbitol	23071201	1
Gatt-Koller / Phoenix	Sorbitol	1718/05134013	1
Caelo	Sorbitol	26071402	1
EuRho/Anzag	Sorbitol	4712I-02298	1
Euro OTC	Sorbitol	700476	1
Fagron	Sorbitol	M721140	1
Caelo	Sorbitol	10383323	1
Caelo	Sorbitol	13335302	1
Euro OTC	Sorbitol	150652-01	1
Euro OTC	Sorbitol	1406014-01	1

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- 77 001 spectra from 463 *Apo-Ident* customers from a total of 25 461 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Sorbitol* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Sorbitol* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	240	0	72 193
Type B	0	205	0	161 868
Type C	0	153	5	77 001

The substance/substance group *Sorbitol* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.5000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 97.0732 %)
Type C	100.0000 % (> 99.8850 %)	96.8354 % (> 94.9367 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21485	21834	4.61	43.21
21834	21834	0.00	40.94
22293	22293	0.00	41.18
22539	22539	0.00	42.22
22847	21834	2.64	42.88
22849	22849	0.00	39.81

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Soy lecithin (instant form)**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20539-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Soy lecithin (instant form); Lecithinum e sojae plv.

Special notes

When selecting the *Soy lecithin (instant form)* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Soy lecithin (instant form)*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Soy lecithin (in…	13030504	20985	40	1404399
Caelo	Soy lecithin (in…	13279813	21523	40	20130903
Caelo	Soy lecithin (in…	17118101	23370	40	20170620

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Soy lecithin (instant form)*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 120 spectra from 3 reference samples of the substance/substance group *Soy lecithin (instant form)*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Soy lecithin (instant form)	11145311	20448	40
Caelo	Soy lecithin (instant form)	11371501	20539	40
Caelo	Soy lecithin (instant form)	17118101	23445	40

- 161 953 spectra from a total of 3496 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

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- 40 spectra from 20 *Apo-Ident* customers from 26 batches from the substance/substance group *Soy lecithin (instant form)*.

- These include spectra of independent samples from 25 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Soy lecithin (instant form)	13279806	1
Caelo	Soy lecithin (instant form)	14281605	1
Caelo	Soy lecithin (instant form)	14281620	1
Caelo	Soy lecithin (instant form)	11145311	1
Caelo	Soy lecithin (instant form)	11371502	1
Caelo	Soy lecithin (instant form)	13030506	1
Caelo	Soy lecithin (instant form)	12139012	1
Caesar &Loretz GmbH	Soy lecithin (instant form)	13279813	1
Caelo	Soy lecithin (instant form)	14196305	1
Sanacorp	Soy lecithin (instant form)	14196305	1
Caelo	Soy lecithin (instant form)	14281603	1
Caesar & Loretz GmbH	Soy lecithin (instant form)	14281603	1
Caelo	Soy lecithin (instant form)	14281618	4
Caelo	Soy lecithin (instant form)	15262701	3
Caelo	Soy lecithin (instant form)	16223302	1
Caelo	Soy lecithin (instant form)	1526704	1
Caelo	Soy lecithin (instant form)	17081501	1
siehe WE-Prüfprotokoll	Soy lecithin (instant form)	31/14	1
Caelo	Soy lecithin (instant form)	11371504	1
Caelo	Soy lecithin (instant form)	12139001	4
Caesar & Loretz GmbH, 4…	Soy lecithin (instant form)	12139013	1
Caelo	Soy lecithin (instant form)	12139011	3
Caelo	Soy lecithin (instant form)		1
Caelo	Soy lecithin (instant form)	12139002	1
Caelo	Soy lecithin (instant form)	12139008	1
Caelo	Soy lecithin (instant form)	12139013	1
Caelo	Soy lecithin (instant form)	13030503	1
Caesar &Loretz GmbH	Soy lecithin (instant form)	13030503	1
Caelo	Soy lecithin (instant form)	13279804	1
Caelo	Soy lecithin (instant form)	13279814	1

- 77 119 spectra from 463 *Apo-Ident* customers from a total of 25 523 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Soy lecithin (instant form)* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Soy lecithin (instant form)* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	84	36	161 953
Type C	0	37	3	77 119

The substance/substance group *Soy lecithin (instant form)* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	70.0000 % (> 67.5000 %)
Type C	100.0000 % (> 99.8850 %)	92.5000 % (> 85.0000 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20985	20985	0.00	48.58
21523	20985	11.29	52.61
23370	20985	7.62	51.62

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Spironolactone**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	21032-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Spironolactone; Spironolactonum

Special notes

When selecting the *Spironolactone* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Spironolactone*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Spironolactone	1212034-01	21032	42	1403151
Euro OTC	Spironolactone	1602006	22369	30	20160309*
Caelo	Spironolactone	14378715	22385	40	20150211
Fagron	Spironolactone	2294216E20-B06-322016	22942	40	20160531

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 152 spectra of 4 reference samples from the substance/substance group *Spironolactone*. These samples are listed above in the section *calibration samples*. The reference samples originate from 4 different batches.

- 72 281 spectra from a total of 1578 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 395 spectra from 10 reference samples of the substance/substance group *Spironolactone*.

- These include spectra of independent samples from 8 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Spironolactone	1004035-01	20180	50
Euro OTC	Spironolactone	1212034-01	21076	40
Euro OTC	Spironolactone	1602006	22369†	15
Fagron	Spironolactone	15G22-B10-311159	22386	40
Caelo	Spironolactone	160773	22444	60
Euro OTC	Spironolactone	1612002	22909	40
Caelo	Spironolactone	16077305	22954	40
Caelo	Spironolactone	171165	23327	40
Caelo	Spironolactone	172432	23660	30
Euro OTC	Spironolactone	1711013	23888	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 678 spectra from a total of 3489 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 199 spectra from 89 *Apo-Ident* customers from 90 batches from the substance/substance group *Spironolactone*.

- These include spectra of independent samples from 88 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Spironolactone	10H24-N10	2
Gutenberg-Apotheke	Spironolactone	12049130	2
Caelo	Spironolactone	12049130	2
Euro OTC	Spironolactone	1212034-01	4
Caelo	Spironolactone	13124303	7
Caesar/Lorenz	Spironolactone	13124303	1
Sanacorp	Spironolactone	1212034-01	1
Caelo	Spironolactone	13124304	6
Caelo	Spironolactone	13124309	5
Caelo	Spironolactone	13124314	2
Caelo	Spironolactone	13124315	7
Sanacorp/Phoenix	Spironolactone	13124315	3
Caelo	Spironolactone	13124317	5
Caelo	Spironolactone	13124321	2
Caelo	Spironolactone	13124320	1
Caelo	Spironolactone	1314309	1
Caelo	Spironolactone	13190309	1
Fagron	Spironolactone	13G03-N09	1
Fagron	Spironolactone		1
Fagron	Spironolactone	13G16-B08	1
Fagron	Spironolactone	13G16-B08-288051	1
Caelo	Spironolactone	140202901	1
Euro OTC	Spironolactone	1402029-01	1
Caelo	Spironolactone	1437807	1
Caelo	Spironolactone	14378701	3
Caelo	Spironolactone	14378702	2
Noweda	Spironolactone	14378702	1
Caelo	Spironolactone	14378703	1
Caelo	Spironolactone	14378707	2
Caelo	Spironolactone	14378710	2
Caelo	Spironolactone	14378709	2
Noweda	Spironolactone	14378710	1
Caelo	Spironolactone	14378715	4
Jenne	Spironolactone	14378715	1
Caelo	Spironolactone	14378717	4
Stumpf	Spironolactone	14378718	1
Caelo	Spironolactone	14378718	4
Caelo	Spironolactone	14378719	1

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Supplier	Substance	Batch	Spectra
Caelo	Spironolactone	14378721	1
Fagron	Spironolactone	14B20-B06-294618	5
Fagron	Spironolactone	14B20B06294618	1
Fagron	Spironolactone	14J02-B02-303621	5
Caelo	Spironolactone	150401601	1
Fagron	Spironolactone	14J02-B303621	1
Euro OTC	Spironolactone	1504016-01	1
Caelo	Spironolactone	15G22-B10	1
Caelo	Spironolactone	16077302	7
Caelo	Spironolactone	16077303	7
Caelo	Spironolactone	16077305	3
Caelo	Spironolactone	16077306	2
Caelo	Spironolactone	16077307	1
Caelo	Spironolactone	16077309	2
Caelo	Spironolactone	16077311	3
Caelo	Spironolactone	16077312	4
Caelo	Spironolactone	16077320	1
Fagron	Spironolactone	16A14-B05-525187	1
Caelo	Spironolactone	16077325	1
Caelo	Spironolactone	16077319	1
Caelo	Spironolactone	16077324	1
Fagron	Spironolactone	16E20-B06-322016	1
Fagron	Spironolactone	16E20-B06-325478	1
Fagron	Spironolactone	16I06-B04	1
Caelo	Spironolactone	17116501	1
Fagron	Spironolactone	17116502	1
gehe	Spironolactone	17E22-B11-335455	1
Fagron	Spironolactone	2415E-03249	1
Fagron	Spironolactone	ELN151105-2	1
Caelo	Spironolactone	5013Q-03249	1
Fagron	Spironolactone	80616-7	1
Euro OTC	Spironolactone	1004035	1
Euro OTC	Spironolactone	1004035-01	2
Caelo	Spironolactone	10159914	1
Noweda	Spironolactone	1101013-0	1
Euro OTC	Spironolactone	1101013-01	1
EuRho	Spironolactone	1101013-01	1
Phönix	Spironolactone	1101013-03	1
Caelo	Spironolactone	11042602	1
ANZAG am 10.05.2012	Spironolactone	11042607	1
Caesar&loretz,Phoenix	Spironolactone	11042603	1
Caelo	Spironolactone	11042607	1
Sanacorp	Spironolactone	11042612	1
Caesar&loretz,Phoenix	Spironolactone	11042613	1
Caelo	Spironolactone	11G28-N03	1
Fagron	Spironolactone	12/17-n01	1
Caelo	Spironolactone	12049103	1
Sanacorp	Spironolactone	12049103	2
Fagron	Spironolactone	12/17-N01	1
Gehe	Spironolactone	12049105	1
Caelo	Spironolactone	12049105	2
Caelo	Spironolactone	12049110	2
Caelo	Spironolactone	12049118	4
Caelo	Spironolactone	12049109	1
Phönix	Spironolactone	12049109	1
Caelo	Spironolactone	12049123	4
Alliance Healthcare	Spironolactone	12049119	1
Caesar u Loretz	Spironolactone	12049119	1
Caelo	Spironolactone	12049129	1
Alliance Healthcare	Spironolactone	12049129	1

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Supplier	Substance	Batch	Spectra
Caesar & Loretz GmbH	Spironolactone	12049129	1
Sanacorp	Spironolactone	12049130	1
Fagron	Spironolactone	12I17-N01	1
Caesar&loretz,Anzag	Spironolactone	13124309	1
Gehe	Spironolactone	13D12-N08	1
Fagron	Spironolactone	13D12-N08	1
Fagron	Spironolactone	16A14-B05-317123	1
Euro OTC	Spironolactone	3513E-03249	1
Gehe	Spironolactone	11B07-N06	2
Caelo	Spironolactone	2013U-03249	1
Fagron	Spironolactone	12J15-N04	1

- 76 960 spectra from 463 *Apo-Ident* customers from a total of 25 457 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Spironolactone* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Spironolactone* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	152	0	72 281
Type B	0	375	20	161 678
Type C	0	190	9	76 960

The substance/substance group *Spironolactone* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.0526 %)
Type B	100.0000 % (> 99.9928 %)	94.9367 % (> 94.1772 %)
Type C	100.0000 % (> 99.8850 %)	95.4774 % (> 93.9698 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested

reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21032	21032	0.00	36.22
22369	22369	0.00	35.55
22385	22369	21.43	34.54
22942	21032	4.18	35.94

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Spray-dried arabic gum**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20457-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Spray-dried arabic gum; Acaciae gummi dispersione desiccatum; Gummi arabicum dispersione desiccatum

Special notes

When selecting the *Spray-dried arabic gum* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Spray-dried arabic gum*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Spray-dried arab…	14141901	21431	80	AR-15-FG-006809-01
Caelo	Spray-dried arab…	15413201	22653	40	AR-17-FG-000844-01

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 2 reference samples from the substance/substance group *Spray-dried arabic gum*. These samples are listed above in the section *calibration samples*. The reference samples originate from 2 different batches.

- 72 313 spectra from a total of 1580 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 200 spectra from 5 reference samples of the substance/substance group *Spray-dried arabic gum*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Spray-dried arabic gum	11345708	20457	40
Caelo	Spray-dried arabic gum	14141901	21431†	40
Caelo	Spray-dried arabic gum	162331	22853	40
Caelo	Spray-dried arabic gum	16233105	23443	40
Caelo	Spray-dried arabic gum	16233105	23444	40

- 161 873 spectra from a total of 3495 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 11 spectra from 9 *Apo-Ident* customers from 10 batches from the substance/substance group *Spray-dried arabic gum*.

- These include spectra of independent samples from 9 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Spray-dried arabic gum	15086704	1
Caelo	Spray-dried arabic gum	11345715	1
Caelo	Spray-dried arabic gum	3314A160121	1
Caelo	Spray-dried arabic gum	15413207	1
Caelo	Spray-dried arabic gum	12111301	1
Caelo	Spray-dried arabic gum	12138607	2
Klenk	Spray-dried arabic gum	3314A140121	1
Caelo	Spray-dried arabic gum	12372302	1
Caelo	Spray-dried arabic gum	15413201	1
Caelo	Spray-dried arabic gum	12138612	1

- 77 148 spectra from 463 *Apo-Ident* customers from a total of 25 538 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Spray-dried arabic gum* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Spray-dried arabic gum* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	200	0	161 873
Type C	0	10	1	77 148

The substance/substance group *Spray-dried arabic gum* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 97.0000 %)
Type C	100.0000 % (> 99.8851 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21431	21431	0.00	15.67
22653	22653	0.00	15.22

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Starch**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20790-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Starch; Amylum Maydis; Amylum oryzae; Amylum Solani; Amylum tritici; Corn starch; Maydis amylum; Oryzae amylum; Potato starch; Rice starch; Solani amylum; Tritici amylum; Wheat starch

Special notes

When selecting the *Starch* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Starch*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Rice starch	12068525	20790	40	20120327
Caelo	Potato starch	12360213	20996	40	1403494
Caelo	Wheat starch	14023203	21447	40	AR-16-FG-011433-01
Caelo	Corn starch	13154914	21827	40	20130529

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Potato starch	14033815	21965	40	20140207
Klenk	Wheat starch	0104A141114	21973	40	20141210
Caelo	Wheat starch	15124707	22246	40	20150527
Caelo	Potato starch	161237	22449	40	20160621*
Caelo	Corn starch	161385	22450	40	20160621*
Caelo	Rice starch	16144501	22585	40	20160504
Caelo	Rice starch	162180	22642	40	20160901*
Fagron	Rice starch	16B25-B01-327231	23220	40	AR-17-FG-015298-02
Klenk	Potato starch	0094A170123	23923	40	20170309

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 520 spectra of 13 reference samples from the substance/substance group *Starch*. These samples are listed above in the section *calibration samples*. The reference samples originate from 13 different batches.

- 71 913 spectra from a total of 1569 batches from further 362 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 706 spectra from 20 reference samples of the substance/substance group *Starch*.

- These include spectra of independent samples from 12 batches, of which no spectra have been used for the generation of the database.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Rice starch	09F02-N03	20038	76
Caelo	Corn starch	91955439	20181	50
Fagron	Wheat starch	10015905	20199	40
Caelo	Potato starch	09352108	20244	50
Caelo	Wheat starch	14023203	21447†	20
Caelo	Corn starch	13154914	21827†	20
Caelo	Potato starch	14033815	21965†	20
Klenk	Wheat starch	0104A141114	21973†	20
Caelo	Wheat starch	15124707	22246†	20
Caelo	Potato starch	161237	22449†	20
Caelo	Corn starch	161385	22450†	20
Caelo	Potato starch	15062921	23189	40
Caelo	Corn starch	16138505	23217	40
Fagron	Rice starch	16B25-B01-327231	23219	30
Caelo	Wheat starch	15421507	23509	40
Klenk	Wheat starch	0104A160512	23510	40
Caelo	Potato starch	173003	23811	40
Caelo	Corn starch	172873	23813	40
Caelo	Wheat starch	181200	24014	40
Caelo	Corn starch	170474	24037	40

- 161 367 spectra from a total of 3479 batches from further 860 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 207 spectra from 109 *Apo-Ident* customers from 85 batches from the substance/substance group *Starch*.

- These include spectra of independent samples from 80 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Rice starch	12238704	1
Caelo	Rice starch	14011612	3
Klenk	Rice starch	64A130304	11
Caelo	Rice starch	14011627	2
Gutenberg-Apotheke	Rice starch	12360216	1
VDL;3,03EUR;11.06.15	Rice starch	14011630	1
Caelo	Rice starch	P134/14	1
Caelo	Corn starch	11179315	2
Caelo	Corn starch	15310902	2
Caelo	Corn starch	1179307	1
Klenk	Corn starch	64A080218	7
Caelo	Corn starch	12238705	2

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†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Supplier	Substance	Batch	Spectra
Caelo	Corn starch	12238715	3
Klenk	Wheat starch	104A120621	2
Klenk	Potato starch	94A130304	4
Klenk	Potato starch	94a170123	1
Caelo	Potato starch	11301012	2
Caelo	Potato starch	14033815	1
Caelo	Potato starch	15062912	2
Klenk	Potato starch	94A110512	1
Bombastus	Potato starch	12214303	2
Klenk	Corn starch	64A130304	13
Caelo	Corn starch	64A130304	4
Caelo	Corn starch	15119011	5
Fagron	Corn starch	15310902	1
Klenk	Corn starch	64A170123	1
Caelo	Corn starch	11179307	2
Caelo	Corn starch	10061146	2
Caelo	Corn starch	13154904	1
Caelo	Corn starch	15310903	2
Caelo	Corn starch	15310904	1
Caelo	Corn starch	15310909	2
Caelo	Corn starch	15310914	3
Caelo	Corn starch	16138505	1
GEHE	Corn starch	64A080218	2
Klenk	Rice starch	84A141114	3
phönix	Rice starch	84a141114	1
Caelo	Rice starch	15118607	2
Caelo	Rice starch	15118611	1
Caelo	Rice starch	10177507	1
Caelo	Rice starch	10177515	1
Caelo	Rice starch	11186027	1
Caelo	Rice starch	14025733	1
Cael/Sanacorp	Rice starch	16144501	2
Caelo	Rice starch	16218002	1
Klenk	Rice starch	64A080218	3
Klenk	Rice starch	104A120621	4
Caelo	Rice starch	11186026	2
Caelo	Rice starch	12166007	3
Caelo	Rice starch	12238714	2
Caelo	Rice starch	12238719	2
Caelo	Rice starch	13005905	2
Caelo	Rice starch	13154904	3
Caelo	Rice starch	200613K3	1
Klenk	Rice starch	84A130304	1
Klenk	Rice starch	64a130304	1
Caelo	Rice starch	64A130304	1
sanacorp	Rice starch	94A130304	1
Klenk	Rice starch	104A130304	7
Klenk	Rice starch	104A141114	3
Caelo	Rice starch	104A141114	1
Caelo	Rice starch	12068520	1
Caelo	Rice starch	13005908	1
Caelo	Rice starch	13089507	1
Caelo	Rice starch	13305103	3
Cealo	Rice starch	13305103	1
Caelo	Rice starch	13305108	1
Caelo	Rice starch	14011621	1
Noweda	Rice starch	14011621	1
Caelo	Rice starch	14011630	2
Noweda	Rice starch	14023203	1
Caelo	Rice starch	14023203	3

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Supplier	Substance	Batch	Spectra
Caelo	Rice starch	14025710	1
Caelo	Rice starch	14301214	1
Fagron	Rice starch	14F18-B04-301616	1
Caelo	Rice starch	15119001	1
Caelo	Rice starch	15119011	1
Caelo	Rice starch	16101401	1
Caelo	Rice starch	2212M-01115	1
Klenk	Rice starch	94A100122	1
Klenk	Rice starch	94A120621	1
Caelo	Rice starch	104A120621	1
Caelo	Rice starch	9352108	1
Caelo	Rice starch	10061134	2
Caelo	Rice starch	11132406	1
Caelo	Rice starch	12214303	1
Caelo	Rice starch	12214307	1
Fagron	Rice starch	12L19-N06	1
Nachprüfung	Rice starch	3709E01116	1
Caelo	Rice starch	13154914	1
Koisser	Rice starch	WE07032013	1
Caelo	Wheat starch	1114611	1
Klenk	Wheat starch	104A141114	4
Klenk	Wheat starch	104a141114	1
Caelo	Wheat starch	104A141114	2
Caelo	Wheat starch	15124707	1
Caelo	Wheat starch	1512477	1
Klenk	Wheat starch	104A160512	4
Klenk	Wheat starch	10A160512	1
Klenk	Wheat starch	104A101116	1
Anzag 17.04.13 ek: 9,65EUR	Wheat starch	104A120621	2
Caelo	Wheat starch	10015911	1
Caelo	Wheat starch	11146011	1
Caelo	Wheat starch	11350907	3
Caelo	Wheat starch	11350911	4
Fiebig 16.01.13 ek: 4,18EUR	Wheat starch	11350911	1

- 76 952 spectra from 463 *Apo-Ident* customers from a total of 25 464 batches from a further 697 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Starch* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Starch* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	520	0	71 913
Type B	0	700	6	161 363
Type C	0	198	9	76 952

The substance/substance group *Starch* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9887 %)	100.0000 % (> 98.8462 %)
Type B	100.0000 % (> 99.9928 %)	99.1501 % (> 98.7252 %)
Type C	100.0000 % (> 99.8850 %)	95.6522 % (> 94.2029 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20790	23220	5.92	21.97
20996	20996	0.00	48.09
21447	21447	0.00	17.46
21827	21447	5.39	18.89
21965	20996	5.94	45.14
21973	21447	3.74	21.12
22246	22450	6.56	21.64
22449	22449	0.00	44.98
22450	22450	0.00	23.38
22585	22450	5.73	24.51
22642	22642	0.00	22.54
23220	23220	0.00	16.25
23923	22449	7.44	38.44

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Stearic acid 50**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20869-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Stearic acid 50; Acidum stearicum; Acidum stearinicum

Special notes

When selecting the *Stearic acid 50* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Stearic acid 50*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Stearic acid 50	12241910	20869	40	AR-15-FG-007284-01
Caelo	Stearic acid 50	14359310	21928	40	AR-16-FG-004044-01
Caelo	Stearic acid 50	14359314	22274	40	20150126

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Stearic acid 50*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 260 spectra from 7 reference samples of the substance/substance group *Stearic acid 50*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Stearic acid 50	14359310	21793	60
Caelo	Stearic acid 50	14359310	21928†	20
Caelo	Stearic acid 50	14359314	22274†	20
Caelo	Stearic acid 50	163469	23032	40
Caelo	Stearic acid 50	170810	23294	40
Caelo	Stearic acid 50	170810	23667	40
Caelo	Stearic acid 50	180809	24036	40

- 161 813 spectra from a total of 3494 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 26 spectra from 18 *Apo-Ident* customers from 14 batches from the substance/substance group *Stearic acid 50*.

- These include spectra of independent samples from 12 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Stearic acid 50	10176203	1
Caelo	Stearic acid 50	12241915	5
Caelo	Stearic acid 50	1224	1
Caelo	Stearic acid 50	12241911	2
Caelo	Stearic acid 50	12241914	1
Phoenix	Stearic acid 50	12241915	1
Caelo	Stearic acid 50	12241930	3
Phönix	Stearic acid 50	1224915	1
Caesar & Loretz	Stearic acid 50	14359310	1
Caelo	Stearic acid 50	14359314	3
Caelo	Stearic acid 50	16096301	1
Caelo	Stearic acid 50	11103706	1
Caelo	Stearic acid 50	16096311	1
Caelo	Stearic acid 50	11308505	1
Caesar&Loretz GmbH/Anzag	Stearic acid 50	11308505	1
Caelo	Stearic acid 50	11308514	2

- 77 133 spectra from 463 *Apo-Ident* customers from a total of 25 533 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Stearic acid 50* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Stearic acid 50* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	260	0	161 813
Type C	0	26	0	77 133

The substance/substance group *Stearic acid 50* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 97.6923 %)
Type C	100.0000 % (> 99.8850 %)	100.0000 % (> 76.9231 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20869	20869	0.00	64.09
21928	21928	0.00	62.21
22274	20869	3.94	61.59

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Sucrose**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20372-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Sucrose; Saccharum

Special notes

When selecting the *Sucrose* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Sucrose*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Sucrose	13352909	21484	40	1410501
Caelo	Sucrose	14340003	21736	40	20141114
Caelo	Sucrose	163286	23057	40	20161219*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Sucrose*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 380 spectra from 10 reference samples of the substance/substance group *Sucrose*.

- These include spectra of independent samples from 9 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Sucrose	11B02-N12	20216	40
Caelo	Sucrose	1901208731	20372	40
Caelo	Sucrose	12146801	20909	40
Caelo	Sucrose	14340003	21736†	20
Caelo	Sucrose	161999	22615	40
Caelo	Sucrose	162060	22643	40
Caelo	Sucrose	163081	23058	40
Caelo	Sucrose	171066	23297	40
Caelo	Sucrose	172133	23666	40
Caelo	Sucrose	173247	23833	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 693 spectra from a total of 3489 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 291 spectra from 113 *Apo-Ident* customers from 137 batches from the substance/substance group *Sucrose*.

- These include spectra of independent samples from 134 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Werner	Sucrose	1901208731	2
Caelo	Sucrose		2
pharm-a-speres	Sucrose	8731003	1
Caelo	Sucrose	11246306	1
Caelo	Sucrose	12241803	2
Caelo	Sucrose	13031405	5
Phönix 13.05.2013	Sucrose	1256433	1
Caelo	Sucrose	13031409	3
Caelo	Sucrose	13352902	15
Caelo	Sucrose	14197302	4
Penny	Sucrose	L12513800	3
Caelo	Sucrose	15028802	5
Soldan	Sucrose	232027	1
Fagron	Sucrose	1011208731	2
Noweda	Sucrose	10179620	1
Fagron	Sucrose	11/16-NO1	1
Fagron	Sucrose	11/16-N01	1
Caelo	Sucrose	11246307	1
Caelo	Sucrose	11246313	2
Fagron	Sucrose	11B02-N12	1
Fagron	Sucrose	11E19-N04	1
Fagron	Sucrose	11I16-N01	1
Fagron	Sucrose	11L09-N16	2
Caelo	Sucrose	12107805	1
Caelo	Sucrose	12107806	1
Caelo	Sucrose	12241801	1
Noweda	Sucrose	12241801	1
Noweda	Sucrose	12241803	1
Caelo	Sucrose	12241804	4
Caelo	Sucrose	12241808	7
Caelo	Sucrose	12241816	2
Euro OTC	Sucrose	12241808	1
Caelo	Sucrose	12241817	3
Caelo	Sucrose	12280309	1
Fagron	Sucrose	12-E03-M01	1
Fagron	Sucrose	12E29-N04	1
Fagron	Sucrose	130100R	1
Caelo	Sucrose	130031417	1
Haushalt	Sucrose	123456	1
Caelo	Sucrose	13031406	2
Caelo	Sucrose	13031410	4

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Supplier	Substance	Batch	Spectra
Caelo	Sucrose	13031414	3
Caelo	Sucrose	13031417	2
Caelo	Sucrose	13352901	3
Caelo	Sucrose	13352905	1
Caelo	Sucrose	13352908	1
	Sucrose	13352908	1
Caelo	Sucrose	13352909	6
Infectopharm/Phoenix	Sucrose	13352909	1
Caelo	Sucrose	13352916	3
Caelo	Sucrose	13352911	1
Noweda	Sucrose	13352920	2
Caelo	Sucrose	13352920	5
Caelo	Sucrose	1352920	1
Fagron	Sucrose	13A07-N03	1
Fagron	Sucrose	13G03-N16	1
Fagron	Sucrose	13I30-N05	1
Fagron	Sucrose	13D29-N08	1
Fagron	Sucrose	13J11-N01	1
Fagron	Sucrose	13K18-B33-288225	1
Caelo	Sucrose	14197301	5
Caelo	Sucrose	14197313	1
Caelo	Sucrose	14340003	3
Caelo	Sucrose	1430009	1
Caelo	Sucrose	14340004	4
Caelo	Sucrose	14340008	2
Sanacorp	Sucrose	14340005	1
Caelo	Sucrose	14340006	1
Caelo	Sucrose	14340005	1
Caelo	Sucrose	14340009	4
Caelo	Sucrose	15028801	14
Caelo	Sucrose	15156008	1
Bombastus	Sucrose	15156008	1
Caelo	Sucrose	15182804	13
Jenne	Sucrose	15182804	1
Caelo	Sucrose	15182805	1
AHD	Sucrose	15182805	1
Caelo	Sucrose	15446002	4
Caeolo/Gehe	Sucrose	15446002	1
Phönix	Sucrose	15446002	1
Fagron	Sucrose	15446002	1
Caelo	Sucrose	15446003	2
Caelo	Sucrose	15446007	1
Caelo	Sucrose	16049902	1
Caelo	Sucrose	16049907	4
Caelo	Sucrose	16051301	1
Caelo	Sucrose	16051305	1
Caelo	Sucrose	16206102	6
Caelo	Sucrose	16328603	1
Caelo	Sucrose	16206103	1
Caelo	Sucrose	16328605	5
Caelo	Sucrose	16328606	1
Noweda	Sucrose	16328607	1
Gehe	Sucrose	16328607	1
phönix	Sucrose	16351701	1
Caelo	Sucrose	17106603	3
Caelo	Sucrose	17106604	3
Caelo	Sucrose	20011401	1
Fagron	Sucrose	18082014D	1
Caelo	Sucrose	20031515	1
Penny Markt	Sucrose	201L113530100	3

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Supplier	Substance	Batch	Spectra
Fagron	Sucrose	2102308731	1
Caelo	Sucrose	23121-02207	1
Caelo	Sucrose	28041504	1
Caelo	Sucrose	28081308	1
Caelo	Sucrose	29081502	1
Caelo	Sucrose	24061502	1
Fagron	Sucrose	5112I-02207	1
Penny Markt	Sucrose	L120325600	2
Sanacorp	Sucrose	AKD5	1
Pfeifer/Langen	Sucrose	L03144N	1
Penny Markt	Sucrose	L120404100	3
Penny Markt	Sucrose	L120628000	3
Kaufland	Sucrose	L24475	1
Kaufland	Sucrose	L24494	2
Fagron	Sucrose	5071201	1
Fagron	Sucrose	11/20-N05	1
Spagyra	Sucrose	12091120645	1
Spagyra	Sucrose	12103020975	1
Spagyra	Sucrose	1210222892	1
Spagyra	Sucrose	12082320717	1
Fagron	Sucrose	12G26-N01	3
Spagyra	Sucrose	13012920302	1
Spagyra	Sucrose	13020620240	1
Spagyra	Sucrose	13030621373	1
Spagyra	Sucrose	13040921431	1
Spagyra	Sucrose	13040921430	1
Spagyra	Sucrose	13040921427	1
Spagyra	Sucrose	13040921424	1
Spagyra	Sucrose	13041920152	1
Spagyra	Sucrose	13041920154	1
Spagyra	Sucrose	13050621773	2
Spagyra	Sucrose	13051520939	1
Spagyra	Sucrose	13051520941	1
Spagyra	Sucrose	13061020524	1
Spagyra	Sucrose	13061020525	1
Spagyra	Sucrose	13061020526	1
Spagyra	Sucrose	13061020529	1
Spagyra	Sucrose	13061020528	1
Caelo	Sucrose	13063907	1
Spagyra	Sucrose	13070420936	1
Spagyra	Sucrose	13061220385	1
Spagyra	Sucrose	13070420938	1
Spagyra	Sucrose	13070420937	1
Spagyra	Sucrose	13072620834	1
Fagron	Sucrose	13G04-N01	1
Staufen-Pharma	Sucrose	161112	2
Gehe 02.07.2013	Sucrose	1911208731	1
Soldan	Sucrose	243983	1
Soldan	Sucrose		1
Penny Markt	Sucrose	L120612100	3

- 76 868 spectra from 463 *Apo-Ident* customers from a total of 25 413 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Sucrose* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Sucrose* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	299	81	161 693
Type C	0	244	47	76 868

The substance/substance group *Sucrose* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	78.6842 % (> 77.8947 %)
Type C	100.0000 % (> 99.8850 %)	83.8488 % (> 82.8179 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21484	21484	0.00	54.13
21736	21484	2.03	52.84
23057	23057	0.00	53.29

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Sulfacetamide**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20695-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Sulfacetamide; Sulfacetamidum

Special notes

When selecting the *Sulfacetamide* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Sulfacetamide*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Sulfacetamide	11085910	20695	40	1402651
Euro OTC	Sulfacetamide	1312012-01	21633	40	20140117
Euro OTC	Sulfacetamide	1509018	21902	40	20150929*
Caelo	Sulfacetamide	15445901	23251	40	20160126

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 4 reference samples from the substance/substance group *Sulfacetamide*. These samples are listed above in the section *calibration samples*. The reference samples originate from 4 different batches.

- 72 273 spectra from a total of 1578 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 160 spectra from 5 reference samples of the substance/substance group *Sulfacetamide*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Sulfacetamide	10145802	20140	40
Euro OTC	Sulfacetamide	1312012-01	21633†	20
Euro OTC	Sulfacetamide	1509018	21902†	20
Euro OTC	Sulfacetamide	1702006	23157	40
Caelo	Sulfacetamide	15445901	23456	40

- 161 913 spectra from a total of 3494 batches from further 863 substances. These spectra were

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 54 spectra from 22 *Apo-Ident* customers from 18 batches from the substance/substance group *Sulfacetamide*.

- These include spectra of independent samples from 16 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Euro OTC	Sulfacetamide	1312012-01	4
Gehe	Sulfacetamide	1312012-01	2
Euro OTC	Sulfacetamide	1312012-02	2
EuRho/Phönix	Sulfacetamide	131201202	1
Phönix Gotha	Sulfacetamide	1312012-02	1
Euro OTC	Sulfacetamide	1509018-01	4
Euro OTC	Sulfacetamide	1509018-02	2
Fagron	Sulfacetamide	1509018-02	2
Caelo	Sulfacetamide	10145802	1
Industrias GmbH / Ph	Sulfacetamide	64518	1
Phönix Gotha	Sulfacetamide	10145811	2
Caelo	Sulfacetamide	10145811	1
Gehe	Sulfacetamide	11085904	1
Klenk	Sulfacetamide	11085904	1
Phoenix am 15.06.2012	Sulfacetamide	11085904	1
Phönix Gotha	Sulfacetamide	11085909	1
Phönix	Sulfacetamide	11085910	1
Caelo	Sulfacetamide	11085911	3
Caelo	Sulfacetamide	11085909	1
Phönix Gotha	Sulfacetamide	11085911	1
Caelo	Sulfacetamide	11085912	3
Caelo	Sulfacetamide	11085914	2
AHC 12.08.13 EK9,31	Sulfacetamide	11085912	1
Gehe	Sulfacetamide	1112032-01	5
Euro OTC	Sulfacetamide	1112032-01	3
Euro OTC	Sulfacetamide	1112032-02	5
Caelo	Sulfacetamide	11085913	1
Caelo	Sulfacetamide	11095912	1

- 77 105 spectra from 463 *Apo-Ident* customers from a total of 25 529 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Sulfacetamide* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all

relevant spectra of the various substances were compared with *Sulfacetamide* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	72 273
Type B	0	150	10	161 913
Type C	0	48	6	77 105

The substance/substance group *Sulfacetamide* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9928 %)	93.7500 % (> 91.8750 %)
Type C	100.0000 % (> 99.8850 %)	88.8889 % (> 83.3333 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20695	20695	0.00	64.05
21633	21902	4.99	63.33
21902	21902	0.00	57.48
23251	21902	7.84	72.97

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Sulfadiazine**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20753-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Sulfadiazine; Sulfadiazinum

Special notes

When selecting the *Sulfadiazine* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Sulfadiazine*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Sulfadiazine	12164101	20753	40	1402053
Caelo	Sulfadiazine	13150011	21744	40	20130708
Caelo	Sulfadiazine	17056602	23447	40	20170330

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Sulfadiazine*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 140 spectra from 4 reference samples of the substance/substance group *Sulfadiazine*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Sulfadiazine	13150011	21744†	20
Caelo	Sulfadiazine	170566	23319	40
Caelo	Sulfadiazine	17056602	23374	40
Caelo	Sulfadiazine	172222	23630	40

- 161 933 spectra from a total of 3495 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 2 spectra from 2 *Apo-Ident* customers from 2 batches from the substance/substance group *Sulfadiazine*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Sulfadiazine	13150004	1
Caelo	Sulfadiazine	11194204	1

- 77 157 spectra from 463 *Apo-Ident* customers from a total of 25 545 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Sulfadiazine* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Sulfadiazine* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	140	0	161 933
Type C	0	2	0	77 157

The substance/substance group *Sulfadiazine* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 95.7143 %)
Type C	100.0000 % (> 99.8856 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20753	20753	0.00	96.75
21744	20753	3.44	96.75
23447	20753	7.65	94.42

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Sulfogaiacol hydrate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20327-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Sulfogaiacol hydrate; Kalii sulfuajacolicum; Sulfoguaiacolum hydricum

Special notes

When selecting the *Sulfogaiacol hydrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Sulfogaiacol hydrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Sulfogaiacol hyd…	13405805	21696	30	20140108
Gatt-Koller	Sulfogaiacol hyd…	1156/04152115	21843	40	20150410
Gatt-Koller	Sulfogaiacol hyd…	4543/01170317	23113	40	AR-17-FG-012520-01

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 110 spectra of 3 reference samples from the substance/substance group *Sulfogaiacol hydrate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 323 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 167 spectra from 6 reference samples of the substance/substance group *Sulfogaiacol hydrate*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Sulfogaiacol hydrate	10353605	20327	40
Caelo	Sulfogaiacol hydrate	13405805	21696†	15
Gatt-Koller	Sulfogaiacol hydrate	1156/04152115	21843†	20
Caelo	Sulfogaiacol hydrate	170919	23300	40
Caelo	Sulfogaiacol hydrate	170919	23306	40
Caelo	Sulfogaiacol hydrate	15343912	not required	12

- 161 906 spectra from a total of 3494 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 0 spectra from 0 *Apo-Ident* customers from 0 batches from the substance/substance group *Sulfogaiacol hydrate*.

- These include spectra of independent samples from 0 batches, of which no spectra have been used for the generation of the database.

- 77 159 spectra from 463 *Apo-Ident* customers from a total of 25 547 batches from a further 701 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Sulfogaiacol hydrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Sulfogaiacol hydrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	110	0	72 323
Type B	0	155	12	161 906
Type C	0	0	0	77 159

The substance/substance group *Sulfogaiacol hydrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 94.5455 %)
Type B	100.0000 % (> 99.9928 %)	92.8144 % (> 91.0180 %)
Type C	100.0000 % (> 99.8849 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21696	23113	8.43	77.62
21843	23113	7.44	78.83
23113	23113	0.00	81.96

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**SyrSpend® SF alka / pH4**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	22496-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

SyrSpend® SF alka / pH4; SyrSpend® SF Alka; SyrSpend® SF pH4

Special notes

When selecting the *SyrSpend® SF alka / pH4* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *SyrSpend® SF alka / pH4*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	SyrSpend® SF pH4	15A26-B04-311720	22496	40	1608352
Fagron	SyrSpend® SF pH4	15A26-B04-305667	22719	40	1701055
Fagron	SyrSpend® SF Alka	17D11-B04-332593	23448	40	20170505
Fagron	SyrSpend® SF Alka	17F14-B02-335945	23750	20	1804106

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 140 spectra of 4 reference samples from the substance/substance group *SyrSpend® SF alka / pH4*. These samples are listed above in the section *calibration samples*. The reference samples originate from 4 different batches.

- 72 293 spectra from a total of 1578 batches from further 364 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 380 spectra from 10 reference samples of the substance/substance group *SyrSpend® SF alka / pH4*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	SyrSpend® SF Alka	15H11-B04-311722	22494	40
Fagron	SyrSpend® SF Alka	15H11-B04-311722	22495	40
Fagron	SyrSpend® SF pH4	15A26-B04-311720	22497	40
Fagron	SyrSpend® SF Alka	15H11-B04-311722	22718	40
Fagron	SyrSpend® SF Alka	17D11-B04-332593	23449	40
Fagron	SyrSpend® SF pH4	15H13-B03-314611	23450	40
Fagron	SyrSpend® SF pH4	15H13-B03-314611	23451	40
Fagron	SyrSpend® SF pH4	16J10-B03-330757	23749	40
Fagron	SyrSpend® SF Alka	17F14-B02-335945	23750†	20
Fagron	SyrSpend® SF Alka	15H11-B04-311722	23768	40

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 693 spectra from a total of 3493 batches from further 862 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 5 spectra from 4 *Apo-Ident* customers from 4 batches from the substance/substance group *SyrSpend® SF alka / pH4*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	SyrSpend® SF Alka	15K03-B01-525173	1
Fagron	SyrSpend® SF Alka	17D11-B04	2
Fagron	SyrSpend® SF Alka	17D11-B04-332593	1
Fagron	SyrSpend® SF Alka	17D11-bo4-332593	1

- 77 154 spectra from 463 *Apo-Ident* customers from a total of 25 543 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *SyrSpend® SF alka / pH4* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *SyrSpend® SF alka / pH4* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	140	0	72 293
Type B	0	257	123	161 693
Type C	0	0	5	77 154

The substance/substance group *SyrSpend® SF alka / pH4* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.7143 %)
Type B	100.0000 % (> 99.9928 %)	67.6316 % (> 66.8421 %)
Type C	100.0000 % (> 99.8852 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
22496	22496	0.00	21.29
22719	22719	0.00	12.43
23448	23750	13.87	28.67
23750	23750	0.00	23.91

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Tannin**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20018-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Tannin; Acidum tannicum; Tanninum

Special notes

When selecting the *Tannin* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Tannin*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Tannin	12336016	21608	40	20121127
Fagron	Tannin	13H30-B03-287645	21653	40	1711482
Fagron	Tannin	16D08-B04-328410	23211	40	AR-17-FG-015963-01
Caelo	Tannin	172092	23631	40	20170829*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 4 reference samples from the substance/substance group *Tannin*. These samples are listed above in the section *calibration samples*. The reference samples originate from 4 different batches.

- 72 273 spectra from a total of 1578 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 200 spectra from 5 reference samples of the substance/substance group *Tannin*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Tannin	81318508	20018	80
Caelo	Tannin	12336016	21608†	20
Fagron	Tannin	13H30-B03-287645	21653†	20
Caelo	Tannin	16074504	23205	40
Fagron	Tannin	16D08-B04-328410	23501	40

- 161 873 spectra from a total of 3494 batches from further 863 substances. These spectra were

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 260 spectra from 151 *Apo-Ident* customers from 93 batches from the substance/substance group *Tannin*.

- These include spectra of independent samples from 90 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Tannin	11302306	1
Caelo	Tannin	14031913	3
Fagron	Tannin	12H14-N05	6
Caelo	Tannin	12171101	7
Fagron	Tannin	2212M-01052	1
A.H.D.	Tannin	13E27-N08	1
Caelo	Tannin	12336011	4
Caelo	Tannin	11302307	7
Fagron	Tannin	12H14N05	1
Caelo	Tannin	2211Q-01052	1
Caelo	Tannin	12336016	10
Sanacorp	Tannin		1
Caelo	Tannin	9128601	1
Caelo	Tannin	12171106	9
Caelo	Tannin	12336009	11
Caelo	Tannin	14031903	4
Caelo	Tannin	16074518	1
Hirsch	Tannin	1811209	1
Caelo	Tannin	9128608	1
Caelo	Tannin	10019007	2
Fagron	Tannin	1014A-01052	1
Phönix	Tannin	10313107Retest	1
Caelo	Tannin	10315107	3
Caelo	Tannin	10315110	2
Phönix	Tannin	10315110	1
Caesar/Lorenz	Tannin	11302307	1
Fagron	Tannin	11C09-N05	1
Noweda	Tannin	11G01-N08	1
Anzag	Tannin	12171101	1
Caelo	Tannin	12171102	1
Sanacorp	Tannin	12171102	1
Caelo	Tannin	12171103	2
Gehe	Tannin	12171106	1
GEHE	Tannin	12171106	1
Caelo	Tannin	12171110	2
Caelo	Tannin	12336001	13
Caelo	Tannin	12301515	1
Alliance Healthcare	Tannin	12336001	1
Gehe	Tannin	12336001	1
Caelo	Tannin	12336005	2
Caelo	Tannin	12336007	2
Sanacorp	Tannin	12336011	1

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Supplier	Substance	Batch	Spectra
Caelo	Tannin	12336013	5
Phoenix	Tannin	12336013	1
Caelo	Tannin	12336014	6
Sanacorp	Tannin	12336014	1
Gehe	Tannin	12336016	2
Caelo	Tannin	1236001	1
Anzag, 24.10.2012	Tannin	12A27-N01	1
Fagron	Tannin	12A27-N01	1
Fagron	Tannin	12E21-N04	5
Gehe	Tannin	12H14-N05	1
Caelo	Tannin	13031401	1
Fagron	Tannin	13B28-N08	1
Caelo	Tannin	13E27-N08	1
Fagron	Tannin	13H30-B03-287645	2
Fagron	Tannin	13H30-B03287645	1
Caelo	Tannin	14031901	2
Caelo	Tannin	14031905	5
Caelo	Tannin	14031912	3
Sanacorp	Tannin	14031912	1
Caelo	Tannin	14031915	2
Caelo	Tannin	14031918	4
Caelo	Tannin	14031919	6
Caelo	Tannin	14031920	1
Fagron	Tannin	14A07-B01-293468	6
phönix	Tannin	14E07-B03-293744	1
Fagron	Tannin	14E07-B03-298480	2
Fagron	Tannin	14e07-b03-298480	1
Fagron	Tannin	14J06-B04	1
Fagron	Tannin	14J06-B04-0858	1
Fagron	Tannin	14J06-B04-299398	3
Fagron	Tannin	14J06B04299398	1
Fagron	Tannin	14K17-B08	1
Fagron	Tannin	14K17-B08-306993	1
Caleo/Phoenix	Tannin	14K17-B08-306993	1
phönix	Tannin	15/AKD65	1
Caelo	Tannin	15091503	1
Caelo	Tannin	15091504	4
Caelo	Tannin	15091506	1
Ebert u. Jacobi 16.0...	Tannin	15091509	1
Caelo	Tannin	15091509	9
Caelo	Tannin	15091511	2
Caelo	Tannin	15091512	1
Caelo	Tannin	15091515	5
Caelo	Tannin	15243801	10
Caelo	Tannin	1509503	1
Caelo	Tannin	15243802	3
Caelo	Tannin	15F23-B01-326357	1
Frago/Gehe	Tannin	15F23-B01	1
Fagron	Tannin	15F23-B01-326357	1
Fagron	Tannin	15F23B01326357	1
Fagron	Tannin	160300029	2
Fagron	Tannin	160300126	1
Fagron	Tannin	160300069	1
Fagron	Tannin	160300146	2
Fagron	Tannin	160300178B	1
Caelo	Tannin	16074504	5
Gehe	Tannin	16074504	1
Caelo	Tannin	16074509	2
Caelo	Tannin	16074505	1
Caelo	Tannin	16074517	1

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Supplier	Substance	Batch	Spectra
Fagron	Tannin	16D08-B04	1
Caelo	Tannin	21101305	1
Fagron	Tannin	16D08-b04	1
Caelo	Tannin	28011502	1
Gatt-Koller / Phoenix	Tannin	3335/08134613	1
Gatt-Koller / Phoenix	Tannin	333508134613	2
Synopharm/Anzag	Tannin	3411I-01052	1
Caelo	Tannin	4413I1052	1
Nachprüfung	Tannin	5210A-01052	1
Caelo	Tannin		1
Fagron	Tannin	13E27-N08	1
Caelo	Tannin	1524308	1

- 76 899 spectra from 463 *Apo-Ident* customers from a total of 25 457 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Tannin* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Tannin* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	72 273
Type B	0	200	0	161 873
Type C	0	260	0	76 899

The substance/substance group *Tannin* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 97.0000 %)
Type C	100.0000 % (> 99.8850 %)	100.0000 % (> 97.6923 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21608	23631	12.92	50.79
21653	21653	0.00	51.55
23211	23211	0.00	49.98
23631	23631	0.00	50.97

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Tartaric acid**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20014-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Tartaric acid; Acidum tartaricum

Special notes

When selecting the *Tartaric acid* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Tartaric acid*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Tartaric acid	15130201	22383	40	20150416
Caelo	Tartaric acid	15164001	22384	40	1704461
Fagron	Tartaric acid	13I25-B01-294093	22391	40	1711509
Fagron	Tartaric acid	14G07-B02-308554	22501	40	20140827
Caelo	Tartaric acid	161468	22613	40	20160607*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 200 spectra of 5 reference samples from the substance/substance group *Tartaric acid*. These samples are listed above in the section *calibration samples*. The reference samples originate from 5 different batches.

- 72 233 spectra from a total of 1577 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 310 spectra from 9 reference samples of the substance/substance group *Tartaric acid*.

- These include spectra of independent samples from 6 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Tartaric acid	90800249	20014	30
Caelo	Tartaric acid	10199711	20493	40
Caelo	Tartaric acid	12044101	20494	40
Caelo	Tartaric acid	13217803	21457	60
Caelo	Tartaric acid	15130201	22383†	20
Caelo	Tartaric acid	15164001	22384†	20
Fagron	Tartaric acid	13I25-B01-294093	22391†	20
Fagron	Tartaric acid	14G07-B02-322976	23527	40
Caelo	Tartaric acid	181212	24015	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 763 spectra from a total of 3490 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 197 spectra from 98 *Apo-Ident* customers from 114 batches from the substance/substance group *Tartaric acid*.

- These include spectra of independent samples from 110 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Beiersdorf AG	Tartaric acid	11G19-N08	1
Fischar/Phönix	Tartaric acid	704021	1
Fagron	Tartaric acid	13B15-N01	6
Fagron	Tartaric acid	12131	2
Fagron	Tartaric acid	12F18-No2	1
VDL; 16.7.15; 4,59EUR	Tartaric acid	14186213	1
Phoenix	Tartaric acid	12Ho2-N07	1
Caelo	Tartaric acid	10b25-n05	1
Otto Fischer	Tartaric acid	7020601	1
Noweda/ Fischar	Tartaric acid	702061	1
Gehe	Tartaric acid	703061	1
Fischar	Tartaric acid	704061	2
Phönix Gotha	Tartaric acid	704021	1
Otto Fischar	Tartaric acid	705061	2
Apotheke Bauer & Cie. oHG	Tartaric acid	706061	1
Spangropharm	Tartaric acid	10073111	1
apomix	Tartaric acid		3
schubert / Phoenix	Tartaric acid	1014PLV-755	1
ANZAG am 16.05.2012	Tartaric acid	10180708	1
Caelo	Tartaric acid	10180708	2
Caelo	Tartaric acid	10180713	2
Caelo	Tartaric acid	10180714	1
Caelo	Tartaric acid	10199706	1
Caelo	Tartaric acid	10199713	1
Fagron	Tartaric acid	1106211053	1
Phönix	Tartaric acid	1106023-01	1
ANZAG am 15.05.2012	Tartaric acid	1108049-01	1
Caelo	Tartaric acid	1111	2
Caelo	Tartaric acid	11169406	2
Fagron	Tartaric acid	11E24-N06	1
Caelo	Tartaric acid	1169406	1
Phönix	Tartaric acid	11e24-n06	1
Fagron	Tartaric acid	11E24-N060752/764	2
Caelo	Tartaric acid	12044101	2
Caelo	Tartaric acid	1204102	1
Euro OTC	Tartaric acid	12044101	1
Noweda	Tartaric acid	11G19-N08	1
Caelo	Tartaric acid	12044102	4
Caesar & Loretz/ Noweda	Tartaric acid	12044103	1
Caelo	Tartaric acid	12044103	4

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Supplier	Substance	Batch	Spectra
Caelo	Tartaric acid	12044112	1
Phoenix	Tartaric acid	12044115	1
Caelo	Tartaric acid	12044119	3
Caelo	Tartaric acid	12240413	1
Caelo	Tartaric acid	12240402	1
Caelo	Tartaric acid	12240415	1
Phönix	Tartaric acid	12286904	1
Caelo	Tartaric acid	12286903	2
Caelo	Tartaric acid	12286904	1
Caelo	Tartaric acid	12286906	3
Caelo	Tartaric acid	12286911	1
canea, anzag	Tartaric acid	12286906	1
Caelo	Tartaric acid	12286924	1
Caelo	Tartaric acid	12286927	1
Caelo	Tartaric acid	12286929	1
Caelo	Tartaric acid	12286932	2
Caelo	Tartaric acid	12286934	1
Fagron	Tartaric acid	12F18-N02	1
Caelo	Tartaric acid	12286939	1
Caelo	Tartaric acid	12286936	1
Fagron	Tartaric acid	12H02-N07	7
Caelo	Tartaric acid	12H02-n07	1
GEHE 14.04.2014	Tartaric acid	12H02-N07	1
Fagron	Tartaric acid	12K16-N02	2
Phoenix	Tartaric acid	12K29B01	1
Fagron	Tartaric acid	12K29-B01-285247	1
Fagron	Tartaric acid	13/25-B01-285488	2
Fagron	Tartaric acid	13/25-B01-285487	1
Caelo	Tartaric acid	13116306	3
Caelo	Tartaric acid	13116307	1
Anzag	Tartaric acid	13116308	1
Caelo	Tartaric acid	13116308	4
Phoenix	Tartaric acid	13116308	1
Caelo	Tartaric acid	13217806	2
Caelo	Tartaric acid	13217807	1
Fagron	Tartaric acid	1325-B01-285488	1
Gehe	Tartaric acid	1325-B01-285487	1
Fagron	Tartaric acid	1325-B01-294093	1
Fagron	Tartaric acid	13B15N01	1
Caelo	Tartaric acid	13B15-N01	3
Fragon/Gehe	Tartaric acid	13G03-N14	3
GEHE 14.04.2014	Tartaric acid	13G03-N14	2
Fagron	Tartaric acid	13I25-B01-285487	1
Fagron	Tartaric acid	13I25-B01-285488	2
Fagron	Tartaric acid	13I25-B01-294094	3
Fagron	Tartaric acid	13I25-B01-294093	1
Fagron	Tartaric acid	13I25-B01-294095	1
Fagron	Tartaric acid	13l25-B01-285488	1
Caelo	Tartaric acid	13l25-B01-294093	1
Caelo	Tartaric acid	14054521	1
Fagron	Tartaric acid	14186212	1
Caelo	Tartaric acid	14186213	4
Fagron	Tartaric acid	14G07-B02	1
Fagron	Tartaric acid	14G07-B02-308554	1
Caelo	Tartaric acid	15045302	2
Caelo	Tartaric acid	14G07-B02-308555	1
Fagron	Tartaric acid	15045303	1
Caelo	Tartaric acid	15045303	1
Caelo	Tartaric acid	15045304	1
Caelo	Tartaric acid	151302	1

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Supplier	Substance	Batch	Spectra
Caelo	Tartaric acid	15130201	4
Caelo	Tartaric acid	15130206	1
Caelo	Tartaric acid	15130205	2
Caelo	Tartaric acid	15164001	4
Caelo	Tartaric acid	15164008	2
Caelo	Tartaric acid	15164002	3
Caelo	Tartaric acid	15164010	1
Caelo	Tartaric acid	15349101	1
Caelo	Tartaric acid	15349102	2
Caelo	Tartaric acid	15349105	1
Caelo	Tartaric acid	15349106	2
Caelo	Tartaric acid	15349109	1
Caelo	Tartaric acid	16260404	2
Caelo	Tartaric acid	16260405	1
Caelo	Tartaric acid	17091402	1
Fagron	Tartaric acid	2112I-01053	1
Fagron	Tartaric acid	20151112-2	1
Fagron	Tartaric acid	2405211053	1
Fagron	Tartaric acid	2414E1053	1
Fagron	Tartaric acid	2513M01053	1
Gatt-Koller / Phoenix	Tartaric acid	3334/08131514	1
Caelo	Tartaric acid	4110N-01053	1
Fischar / Gehe	Tartaric acid	3953/V06/14	1
Gehe	Tartaric acid	7284696	1
Caelo	Tartaric acid	9494239	1
Phönix 28.08.2012	Tartaric acid	702061	1
Caelo	Tartaric acid	11k10-n07	1
Fagron	Tartaric acid	10024	1
Fagron	Tartaric acid	xxxxxxx	1
Caelo	Tartaric acid		1

- 76 962 spectra from 463 *Apo-Ident* customers from a total of 25 436 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Tartaric acid* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Tartaric acid* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	200	0	72 233
Type B	0	310	0	161 763
Type C	0	190	7	76 962

The substance/substance group *Tartaric acid* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 98.0645 %)
Type C	100.0000 % (> 99.8850 %)	96.4467 % (> 94.9239 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
22383	22613	5.71	44.99
22384	22384	0.00	43.72
22391	22391	0.00	47.43
22501	22391	2.50	47.85
22613	22613	0.00	45.31

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Taurine**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20403-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Taurine; Taurinum

Special notes

When selecting the *Taurine* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Taurine*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Taurine	1306024-01	21108	40	20130822
Euro OTC	Taurine	1504032-01	21893	40	20150430
Euro OTC	Taurine	1504032-01	21992	40	9167
Euro OTC	Taurine	1602011	22370	40	20160218*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 4 reference samples from the substance/substance group *Taurine*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 273 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 230 spectra from 8 reference samples of the substance/substance group *Taurine*.

- These include spectra of independent samples from 4 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Taurine	10K15-N01	20403	40
Euro OTC	Taurine	1306024-01	21108†	10
Euro OTC	Taurine	1504032-01	21893†	20
Euro OTC	Taurine	1504032-01	21992†	20
Euro OTC	Taurine	1602011	22370†	20
Euro OTC	Taurine	1607035	22795	40
Euro OTC	Taurine	1704001	23177	40
Euro OTC	Taurine	1711006	23739	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 843 spectra from a total of 3492 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 23 spectra from 5 *Apo-Ident* customers from 9 batches from the substance/substance group *Taurine*.

- These include spectra of independent samples from 8 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Gehe 18.06.2013	Taurine	1106088	1
Pharmorgana	Taurine	1000140138	1
Euro OTC	Taurine	1111012-01	1
El Compra Import	Taurine	1202125	1
hannes	Taurine	1202125	1
Euro OTC	Taurine	1203018-01	3
Euro OTC	Taurine	1302016-01	5
Euro OTC	Taurine	1306024-01	7
Euro OTC	Taurine	1306024-02	2
Gall Pharma / Phoenix	Taurine		1

- 77 136 spectra from 463 *Apo-Ident* customers from a total of 25 538 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Taurine* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Taurine* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	72 273
Type B	0	230	0	161 843
Type C	0	23	0	77 136

The substance/substance group *Taurine* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 97.3913 %)
Type C	100.0000 % (> 99.8850 %)	100.0000 % (> 73.9130 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21108	22370	2.40	47.50
21893	21992	1.00	49.90
21992	21992	0.00	48.87
22370	22370	0.00	48.65

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Testosterone**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20961-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Testosterone; Testosteronum

Special notes

When selecting the *Testosterone* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Testosterone*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Testosterone	12F13-N02	20729	40	20120628
Euro OTC	Testosterone	1307001-01	20961	40	1402309
Caelo	Testosterone	13406004	21370	40	20131219
Fagron	Testosterone	15E18-B08-307772	21970	40	20150526
Caelo	Testosterone	15244906	21987	40	20150814

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Testosterone	1511005	22232	40	20151119*
Euro OTC	Testosterone	1604049	22561	40	20160510*
Caelo	Testosterone	16311506	23244	40	20161123
Fagron	Testosterone	17J26-B01-342032	23764	40	20171205
Fagron	Testosterone	15E18-B08-307772	21970SI	35	20150526
Caelo	Testosterone	15244906	21987SI	24	20150814
Euro OTC	Testosterone	1511005	22232SI	25	20151119*
Euro OTC	Testosterone	1604049	22561SI	34	20160510*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 478 spectra of 13 reference samples from the substance/substance group *Testosterone*. These samples are listed above in the section *calibration samples*. The reference samples originate from 9 different batches.

- 71 955 spectra from a total of 1573 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 724 spectra from 23 reference samples of the substance/substance group *Testosterone*.

- These include spectra of independent samples from 7 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Testosterone	10F14-N01	20242	40

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*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Testosterone	1106011-01	20591	40
Caelo	Testosterone	13406004	21371	40
Fagron	Testosterone	15E18-B08-307772	21970†	20
Caelo	Testosterone	15244906	21987†	20
Euro OTC	Testosterone	1511005-01	21994	60
Euro OTC	Testosterone	1511005	22232†	20
Euro OTC	Testosterone	1607013	22707	40
Euro OTC	Testosterone	1702017	23146	40
Caelo	Testosterone	171199	23347	40
Caelo	Testosterone	171199	23670	30
Euro OTC	Testosterone	1802015	23948	40
Fagron	Testosterone	15E18-B08-307772	21970SI†	19
Caelo	Testosterone	15244906	21987SI†	14
Euro OTC	Testosterone	1511005-01	21994SI	32
Euro OTC	Testosterone	1511005	22232SI†	10
Euro OTC	Testosterone	1607013	22707SI	40
Euro OTC	Testosterone	1702017	23146SI	21
Caelo	Testosterone	16311506	23244SI	30
Caelo	Testosterone	171199	23347SI	28
Caelo	Testosterone	171199	23670SI	30
Fagron	Testosterone	17J26-B01-342032	23764SI	30
Euro OTC	Testosterone	1802015	23948SI	40

- 161 349 spectra from a total of 3486 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 76 spectra from 37 *Apo-Ident* customers from 44 batches from the substance/substance group *Testosterone*.

- These include spectra of independent samples from 41 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Testosterone	11/07-N12	2
EuRho	Testosterone	1106011-03	2
Caelo	Testosterone	12176305	3
Caelo	Testosterone		1
Euroo/Phoenix	Testosterone	1307001-01	1
Euro OTC	Testosterone	1307001-01	6
Caelo	Testosterone	13134806	4
Spirig	Testosterone	13406003	1
Caelo	Testosterone	13406004	2

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†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Supplier	Substance	Batch	Spectra
Fagron	Testosterone	13G10-N03	2
Fagron	Testosterone	13g10n03	1
Fagron	Testosterone	13I26-N08	1
Fagron	Testosterone	13L09-B03-294148	1
Fagron	Testosterone	13l09b03294149	1
Fagron	Testosterone	13L09-B03-294149	1
Fagron	Testosterone	13l09b03298118	1
Euro OTC	Testosterone	1404002-01	3
Euro OTC	Testosterone	1404002-1	1
Euro OTC	Testosterone	140400201	1
Euro OTC	Testosterone	1408015-01	1
Phönix Gotha	Testosterone	1408015-01	1
Caelo	Testosterone	14201105	1
Caelo	Testosterone	14355605	1
Euro OTC	Testosterone	1511005-01	3
Caelo	Testosterone	15195802	1
Caelo	Testosterone	15195803	1
Caelo	Testosterone	15412201	1
Caelo	Testosterone	15412202	1
Euro OTC	Testosterone	1604049-01	2
Caelo	Testosterone	1604049-01	1
Caelo	Testosterone	16225807	2
Fagron	Testosterone	1712-B05	1
Fagron	Testosterone	GTJ151103	1
Shandong Northwest Manu…	Testosterone	GTJ160510	1
NWM CHina	Testosterone	TE150402	1
Euro OTC	Testosterone	1106011-01	2
Euro OTC	Testosterone	1106011-03	2
Phönix Gotha	Testosterone	1106011-03	1
Euro OTC	Testosterone	110611-003	1
Euro OTC	Testosterone	11o6011-03	1
Euro OTC	Testosterone	1207005-02	2
Klenk	Testosterone	12176305	1
Großhandel	Testosterone	12F13-N02	1
Caelo	Testosterone	13134804	1
Großhandel	Testosterone	13610-N03	1
Großhandel	Testosterone	13G10-N03	1
Haihang Industry	Testosterone	20140114-1	1
Haihang Industry	Testosterone	20140114-2	1
Euro OTC	Testosterone	3x1106011-03	1
Caelo	Testosterone	APL00034466T	1
Fagron	Testosterone	12F13-N02	1
EUro/AHD	Testosterone	1106011-03	1
Caelo	Testosterone	12176301	1

- 77 083 spectra from 463 *Apo-Ident* customers from a total of 25 504 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Testosterone* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Testosterone* and it was evaluated

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how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	478	0	71 955
Type B	0	714	10	161 349
Type C	0	72	4	77 083

The substance/substance group *Testosterone* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9887 %)	100.0000 % (> 98.7448 %)
Type B	100.0000 % (> 99.9928 %)	98.6188 % (> 98.2044 %)
Type C	100.0000 % (> 99.8850 %)	94.7368 % (> 90.7895 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20729	22232	16.43	40.08
20961	20961	0.00	24.82
21370	20961	7.70	29.31
21970	22232	3.33	26.84
21987	22232	3.22	29.68
22232	22232	0.00	32.50
22561	22561	0.00	36.02
23244	20961	5.35	24.91
23764	20961	4.46	26.92

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Testosterone propionate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20880-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Testosterone propionate; Testosteroni propionas; Testosteronum propionicum

Special notes

When selecting the *Testosterone propionate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Testosterone propionate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Testosterone pro…	12163607	20880	40	AR-15-FG-000623-01
Euro OTC	Testosterone pro…	1109024-02	21644	40	1503607
Euro OTC	Testosterone pro…	1511003	22230	40	20151111*
Euro OTC	Testosterone pro…	1512023	22288	30	20151230*
Caelo	Testosterone pro…	15444709	23170	40	1707612
Euro OTC	Testosterone pro…	1511003	22230SI	28	20151111*
Euro OTC	Testosterone pro…	1512023	22288SI	30	20151230*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 248 spectra of 7 reference samples from the substance/substance group *Testosterone propionate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 5 different batches.

- 72 185 spectra from a total of 1577 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 264 spectra from 10 reference samples of the substance/substance group *Testosterone propionate*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Testosterone propionate	1109024-02	21644†	20
Euro OTC	Testosterone propionate	1511003	22230†	20
Euro OTC	Testosterone propionate	1512023	22288†	15
Caelo	Testosterone propionate	170963	23334	40
Euro OTC	Testosterone propionate	1710027	23734	40
Euro OTC	Testosterone propionate	1511003	22230SI†	15
Euro OTC	Testosterone propionate	1512023	22288SI†	15
Caelo	Testosterone propionate	15444709	23170SI	30
Caelo	Testosterone propionate	170963	23334SI	29
Euro OTC	Testosterone propionate	1710027	23734SI	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*).

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- 161 809 spectra from a total of 3493 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 303 spectra from 147 *Apo-Ident* customers from 118 batches from the substance/substance group *Testosterone propionate*.

- These include spectra of independent samples from 116 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Apomix / AHD	Testosterone propionate	40/14	1
Caelo	Testosterone propionate	10L03-N16	2
Euro OTC	Testosterone propionate	1109024-01	1
Caelo	Testosterone propionate	1109024-02	1
Euro OTC	Testosterone propionate	1109024-03	1
Fagron	Testosterone propionate	11G15-N07	2
Caelo	Testosterone propionate	12163610	3
Caelo	Testosterone propionate	12163612	6
Phönix	Testosterone propionate	12163613	1
phoenix	Testosterone propionate	12163615	1
Caelo	Testosterone propionate	12163616	4
Caelo	Testosterone propionate	12163617	4
Phönix	Testosterone propionate	12163617	1
Caelo	Testosterone propionate	12163619	2
Caelo	Testosterone propionate	12163621	1
Fagron	Testosterone propionate	13C08-N02	15
Caelo	Testosterone propionate	13C08-N02	1
Fagron	Testosterone propionate	13F05-N04	20
Fagron	Testosterone propionate	13I03-N02	1
Phönix	Testosterone propionate	13K25-B05	1
Fagron	Testosterone propionate	13K25-B05-287647	11
Fagron	Testosterone propionate	13K25-B05	1
apomix	Testosterone propionate	13K25-B05-287648	1
Fagron	Testosterone propionate	13K25-B05-287648	4
Fagron	Testosterone propionate	13K25B05287648	1
Fagron	Testosterone propionate	13K25-B05-291974	2
Euro OTC	Testosterone propionate	1409037-01	2
Fagron	Testosterone propionate	14A28-B12	2
Fagron	Testosterone propionate	14A28-B12-291977	1
Fagron	Testosterone propionate	14A28-B12-296958	1
Fagron	Testosterone propionate	14A28-B12-296960	2
Fagron	Testosterone propionate	14D15-B03-296959	5
Caelo	Testosterone propionate	14D15-B03-296959	1
Fagron	Testosterone propionate	14L31-B02	3
Fagron	Testosterone propionate	14L31-B02-304721	6
Fagron	Testosterone propionate	14L31B02-304721	1

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Hence, these spectra are not independent and are not of *Type B*.

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Supplier	Substance	Batch	Spectra
Sanacorp	Testosterone propionate	14L31-B02-304721	2
Fagron	Testosterone propionate	14L31-B02-304722	8
Fagron	Testosterone propionate	14L31B02304722	1
Caelo	Testosterone propionate	14L31-B02-304722	2
Anzag	Testosterone propionate	14L31-B02-304722	1
Fagron	Testosterone propionate	15/01-B09	1
Fagron	Testosterone propionate	15/01-B09-318371	1
Caelo	Testosterone propionate	15003002	9
Caelo	Testosterone propionate	15003008	2
Euro OTC	Testosterone propionate	1504023-01	1
Fagron	Testosterone propionate	1501-B09-312867	1
Euro OTC	Testosterone propionate	1511003-01	6
Caelo	Testosterone propionate	15169504	1
Caelo	Testosterone propionate	15444702	3
Phönix	Testosterone propionate	15444702	1
Caelo	Testosterone propionate	15444703	8
Ebert 17.08.16	Testosterone propionate	15444703	1
allianz	Testosterone propionate	15444704	1
Caelo	Testosterone propionate	15444705	1
Caelo	Testosterone propionate	15444706	3
Gehe	Testosterone propionate	15444706	1
Caelo	Testosterone propionate	15444707	1
Caelo	Testosterone propionate	15444711	1
Caelo	Testosterone propionate	15444719	1
Fagron	Testosterone propionate	15D03-B02-310694	1
Caelo	Testosterone propionate	15444712	1
Fagron	Testosterone propionate	15I01-B01-318371	1
Fagron	Testosterone propionate	15I01-B09-312867	2
Fagron	Testosterone propionate	15I01-B09-318371	1
Fagron	Testosterone propionate	15k03-b03	1
Fagron	Testosterone propionate	15K03-B03-315218	6
Fagron	Testosterone propionate	15K03-B-03-315218	1
Galderma	Testosterone propionate	15K03-B03-315218	1
Fagron	Testosterone propionate	16C24B04320784	1
Fagron	Testosterone propionate	16C24-B04-320784	2
Fagron	Testosterone propionate	16E24-B01-322593	5
Fagron	Testosterone propionate	16E24-B01-325476	1
Fagron	Testosterone propionate	16H22-B05	1
Fagron	Testosterone propionate	16H22-B05-326482	2
Fagro/Noweda	Testosterone propionate	16H22-B05-326483	2
Fagron	Testosterone propionate	16H22-B05-326483	2
Fagron	Testosterone propionate	16H22B05326483	1
Fagron	Testosterone propionate	36513M1	2
Gehe/Fragon	Testosterone propionate	17B09B03332376	1
Gatt-Koller	Testosterone propionate	3478/09153915	1
Caelo	Testosterone propionate	36814M1	1
Fagron	Testosterone propionate	36814M1	2
Caelo	Testosterone propionate	36814m1	1
Gatt-Koller	Testosterone propionate	606213811	1
Audor Pharma	Testosterone propionate	AP1109024-03TP	4
Audor Pharma	Testosterone propionate	APZTSP15003-MTP	3
Audor Pharma	Testosterone propionate	AP1109024-03	2
Audor Pharma	Testosterone propionate	AP12J10-N08TP	2
Audor Pharma	Testosterone propionate	AP13K25-B05-287643TP	1
Caelo	Testosterone propionate	12J10-N08	2
Caelo	Testosterone propionate	106212376	1
Fagron	Testosterone propionate	6081201	1
Caelo	Testosterone propionate	612212376	1
Caelo	Testosterone propionate	614E2376	1
Caelo	Testosterone propionate	903312376	1

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Supplier	Substance	Batch	Spectra
Caelo	Testosterone propionate	10235809	1
Caelo	Testosterone propionate	10235821	1
Finze	Testosterone propionate	10366002	1
Fargron	Testosterone propionate	10L03-N16	1
Fagron	Testosterone propionate	10L03-N16	1
Euro OTC	Testosterone propionate	1103010-01	2
Fagron	Testosterone propionate	11/12-N03	1
Phönix/Euro	Testosterone propionate	110301002	1
Phönix	Testosterone propionate	1103010-02	1
Caelo	Testosterone propionate	1108212376	1
Phoenix	Testosterone propionate	1109024-02	1
Andor	Testosterone propionate	1109024-03TP	1
Fagron	Testosterone propionate	11C21-N09	1
Fagron	Testosterone propionate	11K18-N04	5
Caelo	Testosterone propionate	11K18-N04	1
Noweda	Testosterone propionate	11K18-N04	1
Fargron	Testosterone propionate	11K18-N04	1
Fagron	Testosterone propionate	12/10-N08	1
Fagron	Testosterone propionate	12C01-N01	1
Caelo	Testosterone propionate	12060102	3
Caelo	Testosterone propionate	12163607	1
Caelo	Testosterone propionate	12163605	1
Caelo	Testosterone propionate	12163615	1
Fagron	Testosterone propionate	12163616	2
Caelo	Testosterone propionate	1263607	1
Fagron	Testosterone propionate	12A02-N05	5
Caelo	Testosterone propionate	12A02-N05	1
Fagron	Testosterone propionate	12C01-NO1	1
Fagron	Testosterone propionate	12E04-N01	4
Fagron	Testosterone propionate	12E29-N02	1
Fagron	Testosterone propionate	12J10-N08	3
Fagron	Testosterone propionate	12J10N-08	1
Phönix	Testosterone propionate	12J10-N08	1
Fagron	Testosterone propionate	13/03-N02	1
Phönix	Testosterone propionate	13C08-N02	2
Fagron	Testosterone propionate	13C08N02	1
Jenne	Testosterone propionate	13C08-N02	1
Fagron	Testosterone propionate	20121012-3	1
Caelo	Testosterone propionate	2013U-02376	1
Fagron	Testosterone propionate	24411M1	1
Fagron	Testosterone propionate	32012M1	3
Fagron	Testosterone propionate	3613M-02376	1
Euro OTC	Testosterone propionate	970116/1	1
Audor Pharma	Testosterone propionate	AP12E04N01TP	2
Anzag 21.02.2013	Testosterone propionate	AP12E04-N01TP	1
Anzag 04.09.12	Testosterone propionate	AP12E04-N01TP	1
AHD	Testosterone propionate	AP12E04-N01TP	1
Audor Pharma	Testosterone propionate	AP10L03-N16TP	1
Audor Pharma	Testosterone propionate	AP-12J10-N08Tp	1
Audor Pharma	Testosterone propionate	AP13K25-B05-287643T	1
Fagron	Testosterone propionate		1

- 76 856 spectra from 463 *Apo-Ident* customers from a total of 25 430 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Testosterone propionate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Testosterone propionate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	248	0	72 185
Type B	0	264	0	161 809
Type C	0	300	3	76 856

The substance/substance group *Testosterone propionate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.5806 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 97.7273 %)
Type C	100.0000 % (> 99.8850 %)	99.0099 % (> 98.0198 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20880	20880	0.00	8.05
21644	21644	0.00	7.11
22230	22230	0.00	9.10
22288	22288	0.00	8.88
23170	23170	0.00	7.76

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Tetracaine base**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20947-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Tetracaine base; Tetracainum

Special notes

When selecting the *Tetracaine base* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Tetracaine base*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Tetracaine base	12L19-N10	20947	40	20130108
Euro OTC	Tetracaine base	1405025-01	21603	40	AR-14-FG-012475-01
Fagron	Tetracaine base	14A16-B04-292915	21650	40	20140205
Fagron	Tetracaine base	14A16-B04-292916	21659	40	20140205
Euro OTC	Tetracaine base	1512022	22299	30	20160128*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 190 spectra of 5 reference samples from the substance/substance group *Tetracaine base*. These samples are listed above in the section *calibration samples*. The reference samples originate from 5 different batches.

- 72 243 spectra from a total of 1577 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 415 spectra from 11 reference samples of the substance/substance group *Tetracaine base*.

- These include spectra of independent samples from 7 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Tetracaine base	10H05-N08	20231	40
Euro OTC	Tetracaine base	1405025-01	21603†	20
Fagron	Tetracaine base	14A16-B04-292915	21650†	80
Fagron	Tetracaine base	14A16-B04-292916	21659†	20
Euro OTC	Tetracaine base	1512022	22299†	15
Euro OTC	Tetracaine base	1606009	22717	40
Euro OTC	Tetracaine base	1609010	22858	40
Euro OTC	Tetracaine base	1701035	23149	40
Caelo	Tetracaine base	171117	23321	40
Euro OTC	Tetracaine base	1708024	23736	40
Euro OTC	Tetracaine base	1803002	24066	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*).

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- 161 658 spectra from a total of 3488 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 145 spectra from 56 *Apo-Ident* customers from 66 batches from the substance/substance group *Tetracaine base*.

- These include spectra of independent samples from 63 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Euro OTC	Tetracaine base	10887133	1
Euro OTC	Tetracaine base	12081501	1
Euro OTC	Tetracaine base	1312034-01	9
Phönix	Tetracaine base	1312034-01	1
GEHE 04.05	Tetracaine base	1405025-01	1
Euro OTC	Tetracaine base	1405025-01	2
Caelo	Tetracaine base	14A16-B04	1
Euro OTC	Tetracaine base	1405025-02	1
Fagron	Tetracaine base	14A16-B04	1
Fagron	Tetracaine base	14A16-B04-2490207	1
Caelo	Tetracaine base	14A16-B04-290207	1
GEHE 02.05.2014	Tetracaine base	14A16-B04-290208	3
Fagron	Tetracaine base	14A16-B04-290208	3
Fagron	Tetracaine base	14a16-b04-290208	1
Phoenix 07.10.14	Tetracaine base	14A16-B04-292916	1
Fagron	Tetracaine base	14A16-B04-292916	1
Caelo	Tetracaine base	14A16-B04-292916	1
Fagron	Tetracaine base	14G30-B08	2
Fagron	Tetracaine base	14G30-B08-297306	3
Phoenix Goettin	Tetracaine base	14G30-B08-297306	1
Fagron	Tetracaine base	14g30-b08-297306	1
Fagron	Tetracaine base	14K03-B02	2
Fagron	Tetracaine base	14K03B02303178	1
Fagron	Tetracaine base	14K03-B02-303179	2
Fagron	Tetracaine base		1
Fagron	Tetracaine base	15/16-B06-312783	2
Euro OTC	Tetracaine base	151022-01	1
Caelo	Tetracaine base	1516B06312783	1
Fagron	Tetracaine base	15/16-B06-316260	1
Euro OTC	Tetracaine base	1512022-01	1
Caelo	Tetracaine base	1512022-01	1
Fagron	Tetracaine base	1516-B06-316259	1
Faron	Tetracaine base	15D01-B03-306258	2
Fagron	Tetracaine base	15D01-B03-306258	3
Fagron	Tetracaine base	1516-B06-316260	1
Fagron	Tetracaine base	15G30-B04	1

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Hence, these spectra are not independent and are not of *Type B*.

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Supplier	Substance	Batch	Spectra
Hepart	Tetracaine base	15G30-B04-310590	1
Fagron	Tetracaine base	15G30-B04-312060	1
Caelo	Tetracaine base	16/AKD12	1
Euro OTC	Tetracaine base	160600-01	1
Euro OTC	Tetracaine base	1606009-01	4
Fagron	Tetracaine base	1606009-01	1
Euro OTC	Tetracaine base	1609010-01	6
Caelo	Tetracaine base	16A13-B07-318736	4
Caelo	Tetracaine base	16a13-b07-318736	1
Fagron	Tetracaine base	16A13-B07-318736	4
Fagron	Tetracaine base	16E23-B04-323269	2
Caelo	Tetracaine base	16E23-B04	1
Fagron	Tetracaine base	16G29B02325570	2
Fagron	Tetracaine base	16G29-B02-325570	1
Fagron	Tetracaine base	16J12-B06	1
Fagron	Tetracaine base	16J12-B06-327371	1
Ebert-Jacobi	Tetracaine base	16J12-B06-327371	1
Fagron	Tetracaine base	TC0090913	2
Fagron	Tetracaine base	16J12-B06-329087	1
Fagron	Tetracaine base	2913Q-07165	1
Euro OTC	Tetracaine base	TC0091115	1
Phönix	Tetracaine base	3465093	1
Fagron	Tetracaine base	5111202	1
Fagron	Tetracaine base	11D07-N20	1
Phönix	Tetracaine base	11g12-n13	1
Fargron	Tetracaine base	11G12-N13	1
Fagron	Tetracaine base	11G12-N13	4
Fagron	Tetracaine base	11L09-N03	3
Fagron	Tetracaine base	11l01-N09	1
Phönix 19.06.2012	Tetracaine base	11L09-N03	1
Fagron	Tetracaine base	12F26-N05	2
Fagron	Tetracaine base	12115008	1
Fagron	Tetracaine base	12F29-N05	7
phönix, 14.11.2012	Tetracaine base	12F-29-N05	1
Fagron	Tetracaine base	12f29-n05	1
Phoenix 26.03.2013	Tetracaine base	12F29-N05	1
Anzag 08.03.2013	Tetracaine base	12L19-N10	2
Fagron	Tetracaine base	12H23-N07	2
Fagron	Tetracaine base	12L19-N10	6
Phönix	Tetracaine base	1303018-01	1
Fagron	Tetracaine base	13D30-N11	3
Fagron	Tetracaine base	3465093	1
Caelo	Tetracaine base	T-290413-1	1
Fagron	Tetracaine base	14A16-B04-290209	1
Fagron	Tetracaine base	14G30-B08-297305	1
Fagron	Tetracaine base	14G30-B08-297307	1
Fagron	Tetracaine base	14g30-b08-297305	1
Caelo	Tetracaine base	14K03-B02-303179	1
Caelo	Tetracaine base	1606009-01	1

- 77 014 spectra from 463 *Apo-Ident* customers from a total of 25 482 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

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Validation results

The validation runs checked whether the substance/substance group *Tetracaine base* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Tetracaine base* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	190	0	72 243
Type B	0	368	47	161 658
Type C	0	141	4	77 014

The substance/substance group *Tetracaine base* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.8421 %)
Type B	100.0000 % (> 99.9928 %)	88.6747 % (> 87.9518 %)
Type C	100.0000 % (> 99.8850 %)	97.2414 % (> 95.1724 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20947	21603	2.48	53.30
21603	21603	0.00	53.62
21650	22299	5.01	51.25
21659	21603	4.47	54.35
22299	22299	0.00	45.50

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Tetracaine hydrochloride**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20037-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Tetracaine hydrochloride; Tetracaini hydrochloridum; Tetracainum hydrochloricum

Special notes

When selecting the *Tetracaine hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Tetracaine hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Tetracaine hydro…	12019822	20924	40	20120228
Euro OTC	Tetracaine hydro…	1506040	21845	40	20150713*
Euro OTC	Tetracaine hydro…	1512019	22285	30	20151228*
Euro OTC	Tetracaine hydro…	1612005	22912	40	20170112*
Fagron	Tetracaine hydro…	15K04-B03-322151	23162	40	20160112
Caelo	Tetracaine hydro…	15437108	23163	40	20160211

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 230 spectra of 6 reference samples from the substance/substance group *Tetracaine hydrochloride*. These samples are listed above in the section *calibration samples*. The reference samples originate from 6 different batches.

- 72 203 spectra from a total of 1576 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 345 spectra from 10 reference samples of the substance/substance group *Tetracaine hydrochloride*.

- These include spectra of independent samples from 8 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Tetracaine hydrochloride	83228149	20037	30
Fagron	Tetracaine hydrochloride	11A31-N15	20215	40
Euro OTC	Tetracaine hydrochloride	1506040	21845†	20
Euro OTC	Tetracaine hydrochloride	1512019	22285†	15
Euro OTC	Tetracaine hydrochloride	1607031	22708	40
Fagron	Tetracaine hydrochloride	16G28-B03-327368	23500	40
Euro OTC	Tetracaine hydrochloride	1706018	23558	40
Euro OTC	Tetracaine hydrochloride	1712012	23886	40
Euro OTC	Tetracaine hydrochloride	1310006	23910	40
Euro OTC	Tetracaine hydrochloride	1803001	24079	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*).

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- 161 728 spectra from a total of 3489 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 711 spectra from 222 *Apo-Ident* customers from 156 batches from the substance/substance group *Tetracaine hydrochloride*.

- These include spectra of independent samples from 152 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Euro OTC	Tetracaine hydrochloride	1207001-01	16
Euro OTC	Tetracaine hydrochloride	1607031-01	15
Euro OTC	Tetracaine hydrochloride	1207001-02	11
Caelo	Tetracaine hydrochloride	1313012-01	1
Großhandel	Tetracaine hydrochloride	12H24-N05	4
Caelo	Tetracaine hydrochloride	13155711	11
Großhandel	Tetracaine hydrochloride	13D11-N07	7
Großhandel	Tetracaine hydrochloride	13H21-B02-286559	1
Sanacorp	Tetracaine hydrochloride	15/AKD1	1
Caelo	Tetracaine hydrochloride		1
Fagron	Tetracaine hydrochloride	6093547	2
Caelo	Tetracaine hydrochloride	6093549	1
Alliance Health 22.08.2...	Tetracaine hydrochloride	6093549	1
Fagron	Tetracaine hydrochloride	10330837	1
Gatt-Koller / Phoenix	Tetracaine hydrochloride	80/02140614	2
Fagron	Tetracaine hydrochloride	10990834	4
Fagron	Tetracaine hydrochloride	6093549	1
Fagron	Tetracaine hydrochloride	218I-02039	1
Euro OTC	Tetracaine hydrochloride	1106035-01	2
Euro OTC	Tetracaine hydrochloride	1110010-01	7
Euro OTC	Tetracaine hydrochloride	1110010-02	6
Caelo	Tetracaine hydrochloride	1155727	1
Caelo	Tetracaine hydrochloride	12019822	7
gehe	Tetracaine hydrochloride	12C22-N04	1
Euro OTG	Tetracaine hydrochloride	1207001-01	1
Euro OTC	Tetracaine hydrochloride	1303012-01	22
Alliance Health 30.04.2...	Tetracaine hydrochloride	1303012-01	2
Euro OTC	Tetracaine hydrochloride	130301201	3
Euro OTC	Tetracaine hydrochloride		1
Euro OTC	Tetracaine hydrochloride	1310006-01	20
Phoenix am 30.04.2014	Tetracaine hydrochloride	1310006-01	1
EuroTOC / Noweda	Tetracaine hydrochloride	131000601	2
Gehe	Tetracaine hydrochloride	1310006-01	4
Noweda	Tetracaine hydrochloride	1310006-01	1
Euro OTC	Tetracaine hydrochloride	131000601	1
Caelo	Tetracaine hydrochloride	13155703	1

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Hence, these spectra are not independent and are not of *Type B*.

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Supplier	Substance	Batch	Spectra
Caelo	Tetracaine hydrochloride	13155705	3
Caelo	Tetracaine hydrochloride	13155706	11
Gehe 07.07.2014	Tetracaine hydrochloride	13155706	1
Euro OTC	Tetracaine hydrochloride	13155710	4
Fagron	Tetracaine hydrochloride	13155711	1
Gehe	Tetracaine hydrochloride	13155711	2
Caelo	Tetracaine hydrochloride	13155714	3
BASF Fine Chemicals Swi...	Tetracaine hydrochloride	13155714	1
Caelo	Tetracaine hydrochloride	13155716	2
Caelo	Tetracaine hydrochloride	13155720	3
Caelo	Tetracaine hydrochloride	13155724	6
Calo/AHD	Tetracaine hydrochloride	13155727	1
Caelo	Tetracaine hydrochloride	13155727	8
Fagron	Tetracaine hydrochloride	13H21-B02	2
Fagron	Tetracaine hydrochloride	13D11-N07	10
Fagron	Tetracaine hydrochloride	13H21-B02-286558	4
Bombastus	Tetracaine hydrochloride	13H21-B02-286558	1
Alliance Health 05.05.2...	Tetracaine hydrochloride	13H21-B02-286559	1
Fagron	Tetracaine hydrochloride	13H21-B02-286559	1
Fagron	Tetracaine hydrochloride		1
Fagron	Tetracaine hydrochloride	13K25-B04	2
Fagron	Tetracaine hydrochloride	13K25-B04-290276	4
Caelo	Tetracaine hydrochloride	13K25-B04-290276	2
Fagron	Tetracaine hydrochloride	13K25-B04-290278	2
Fagron	Tetracaine hydrochloride	13K25-Bo4-290276	1
Euro OTC	Tetracaine hydrochloride	1405026-01	24
euroct/gehe	Tetracaine hydrochloride	1405026-01	1
Caelo	Tetracaine hydrochloride	1405026-01	1
Gehe	Tetracaine hydrochloride	1405026-01	3
Euro OTC	Tetracaine hydrochloride	140502601	1
Phönix	Tetracaine hydrochloride	1405026-01	1
Euro OTC	Tetracaine hydrochloride	1405026-02	1
Euro OTC	Tetracaine hydrochloride	1405026-04	1
Euro OTC	Tetracaine hydrochloride	1409026	1
Euro OTC	Tetracaine hydrochloride	1409026-01	14
AHD 12.12.14 EK 6,94	Tetracaine hydrochloride	1409026-01	1
Sanacorp	Tetracaine hydrochloride	1409026-01	1
Phoenix Goettin	Tetracaine hydrochloride	1409026-01	1
Euro OTC	Tetracaine hydrochloride	1409026-02	11
Caelo	Tetracaine hydrochloride	1409026-02	3
BASF Pharma S.A.	Tetracaine hydrochloride	1409026-02	1
Euro OTC	Tetracaine hydrochloride	1411019-01	19
Euro OTC	Tetracaine hydrochloride	1411019	1
Caelo	Tetracaine hydrochloride	1411019-01	4
Euro OTC	Tetracaine hydrochloride	141101901	1
Fagron	Tetracaine hydrochloride	1411019-01	1
BASF Pharma	Tetracaine hydrochloride	1411019-01	1
Anzag	Tetracaine hydrochloride	1411019-01	1
Fagron	Tetracaine hydrochloride	1418-03-300199	1
Fagron	Tetracaine hydrochloride	14C18-B03-293966	7
Alliance Health	Tetracaine hydrochloride	14C18-B03-293967	1
Fagron	Tetracaine hydrochloride	14C18-B03-293967	3
Fagron	Tetracaine hydrochloride	14C18-B03-300199	5
Caelo	Tetracaine hydrochloride	14C18-B03-300199	1
Caelo	Tetracaine hydrochloride	14C18-B03-300200	1
Fagron	Tetracaine hydrochloride	14C18-B03-300200	4
Fagron	Tetracaine hydrochloride	14C18-Bo3-300200	1
Fagron	Tetracaine hydrochloride	14c18d03300199	1
Caelo	Tetracaine hydrochloride	14G14-B08	1
Caelo	Tetracaine hydrochloride	14G14-B08-300198	1

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Supplier	Substance	Batch	Spectra
Fagron	Tetracaine hydrochloride	14G14-B08-300198	3
Euro OTC	Tetracaine hydrochloride	1506040-01	24
Euro/Phönix	Tetracaine hydrochloride	1506040-01	1
Euro OTC	Tetracaine hydrochloride	150604001	1
Caelo	Tetracaine hydrochloride	150604001	1
Euro OTC	Tetracaine hydrochloride	1506040-02	7
Caelo	Tetracaine hydrochloride	15079501	2
Caelo	Tetracaine hydrochloride	15079507	2
Euro OTC	Tetracaine hydrochloride	15120019-01	1
Euro OTC	Tetracaine hydrochloride	1512019-01	19
Caelo	Tetracaine hydrochloride	1512019-01	2
Euro OTC	Tetracaine hydrochloride	151-2019-01	1
Caelo	Tetracaine hydrochloride	1512019-02	1
Caelo	Tetracaine hydrochloride	15196102	4
Caelo	Tetracaine hydrochloride	15196103	6
Caelo	Tetracaine hydrochloride	15196104	2
Caelo	Tetracaine hydrochloride	15356902	2
Caelo	Tetracaine hydrochloride	15437102	2
Phoenix	Tetracaine hydrochloride	15437104	2
Caelo	Tetracaine hydrochloride	15437104	16
Caelo	Tetracaine hydrochloride	15437106	3
Caelo	Tetracaine hydrochloride	15437109	10
Caelo	Tetracaine hydrochloride	15437114	5
Fagron	Tetracaine hydrochloride	15437117	1
Caelo	Tetracaine hydrochloride	15437119	5
Fagron	Tetracaine hydrochloride	15A12-B03	1
Caelo	Tetracaine hydrochloride	15A12-B03-306306	1
Fagron	Tetracaine hydrochloride	15A12-B03-308857	4
AHD	Tetracaine hydrochloride	15A12-B03-308857	1
Caelo	Tetracaine hydrochloride	15H24-B03	3
Fagron	Tetracaine hydrochloride	15H24-B03-311450	6
Fagron	Tetracaine hydrochloride	15H24-B03-313594	3
Fagron	Tetracaine hydrochloride	15h24-b03-313594	1
Fagron	Tetracaine hydrochloride	15K04-B03	2
Fagron	Tetracaine hydrochloride	15K04-B03-318368	1
Caelo	Tetracaine hydrochloride	15K04-B03-318368	1
Fagron	Tetracaine hydrochloride	15K04B03318369	1
Caelo	Tetracaine hydrochloride	15K04-B03-318369	1
Fargon Services NL	Tetracaine hydrochloride	15K04-B03-322151	5
Fagron	Tetracaine hydrochloride	15K04-B03-322151	2
Ebert-Jacobi	Tetracaine hydrochloride	15K04-B03-328163	1
Fagron	Tetracaine hydrochloride	15K04-bo3-312151	1
Euro OTC	Tetracaine hydrochloride	1607031	1
Phoenix 04.11.16 Phoeni...	Tetracaine hydrochloride	1607031-01	1
Caelo	Tetracaine hydrochloride	1607031-01	5
Ebert-Jacobi	Tetracaine hydrochloride	1612005-01	1
Euro OTC	Tetracaine hydrochloride	1612005-01	5
Caelo	Tetracaine hydrochloride	1612005-01	1
Phönix	Tetracaine hydrochloride	1612005-01	1
Fagron	Tetracaine hydrochloride	16G28-B03-327368	4
Fagron	Tetracaine hydrochloride	16G28-B03	1
Fagro/Gehe	Tetracaine hydrochloride	16G28-B03-327368	2
Fagron	Tetracaine hydrochloride	16G28-B03-327369	1
Fagron	Tetracaine hydrochloride	221630-0003	1
Euro OTC	Tetracaine hydrochloride	17081503	1
Euro OTC	Tetracaine hydrochloride	24102014A	1
Euro OTC	Tetracaine hydrochloride	4811A-02039	1
Caelo	Tetracaine hydrochloride	4827030	2
BASF/ Phoenix	Tetracaine hydrochloride	6093547	1
Orgamol Pharma	Tetracaine hydrochloride	6093547	1

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Supplier	Substance	Batch	Spectra
Euro OTC	Tetracaine hydrochloride	6093547	1
Fagron	Tetracaine hydrochloride	10990837	2
Caelo	Tetracaine hydrochloride	9070003	2
Caelo	Tetracaine hydrochloride	10118210	2
Caelo	Tetracaine hydrochloride	10118211	1
gehe, 03.01.2013	Tetracaine hydrochloride	10118211	1
Anzag 19.06.2012	Tetracaine hydrochloride	10118218	1
Caelo	Tetracaine hydrochloride	10118218	1
Caelo	Tetracaine hydrochloride	10118225	6
Fagron	Tetracaine hydrochloride	10A29-N12	2
Fagron	Tetracaine hydrochloride	11/15-N12	2
Noweda	Tetracaine hydrochloride	11/15-N12	2
Noweda	Tetracaine hydrochloride	1106035-01	2
EuRho	Tetracaine hydrochloride	1106035-01	2
Noweda	Tetracaine hydrochloride	1106035-02	1
EuRho	Tetracaine hydrochloride	1110010-01	2
Caelo	Tetracaine hydrochloride	1110010-01	1
anzag, 14.11.2012	Tetracaine hydrochloride	1110010-02	1
Caelo	Tetracaine hydrochloride	1110010-02	2
Euro OTC	Tetracaine hydrochloride	111001002	1
Fagron	Tetracaine hydrochloride	11A31-N15	1
Fagron	Tetracaine hydrochloride	11C22-N04	1
Euro OTC	Tetracaine hydrochloride	11110010-02	1
Fagron	Tetracaine hydrochloride	11I15-N12	1
Caelo	Tetracaine hydrochloride	12019802	4
Sanacorp	Tetracaine hydrochloride	12019803	1
Gehe 07.03.2013	Tetracaine hydrochloride	12019810	2
Phoenix 26.03.2013	Tetracaine hydrochloride	12019809	1
Caelo	Tetracaine hydrochloride	12019810	5
Caelo	Tetracaine hydrochloride	12019812	3
Caelo	Tetracaine hydrochloride	12019816	12
Caelo	Tetracaine hydrochloride	12019815	1
phönix 14.08.2013	Tetracaine hydrochloride	12019816	1
Sino Phyto	Tetracaine hydrochloride	12019816	1
Caelo	Tetracaine hydrochloride	12019820	1
Gehe 05.11.2013	Tetracaine hydrochloride	12019822	1
Noweda	Tetracaine hydrochloride	120700-02	1
Fagron	Tetracaine hydrochloride	1207001-01	5
Anzag 07.03.13	Tetracaine hydrochloride	1207001-01	2
Caelo	Tetracaine hydrochloride	1207001-01	1
EuRho Anzag	Tetracaine hydrochloride	1207001-01	1
GEHE	Tetracaine hydrochloride	1207001-01	1
Euro CT Phönix	Tetracaine hydrochloride	1207001-02	1
Sanacorp	Tetracaine hydrochloride	1207001-02	1
Fagron	Tetracaine hydrochloride	12C22-N04	7
Caelo	Tetracaine hydrochloride	12H24-N05	5
Fagron	Tetracaine hydrochloride	12H24-N05	9
Noweda	Tetracaine hydrochloride	12H24-N05	2
Noweda/ BASF Pharma (Ev...	Tetracaine hydrochloride	12H24-N05	1
Alliance Healthcare	Tetracaine hydrochloride	12H24-N05	1
Caelo	Tetracaine hydrochloride	12h24-n05	1
Noveda	Tetracaine hydrochloride	12H24-N05	1
Fagron	Tetracaine hydrochloride	12H24-N050696/1050	1
Fagron	Tetracaine hydrochloride	12H-N05	1
Fagron	Tetracaine hydrochloride	12K01-N04	8
Großhandel	Tetracaine hydrochloride	12K01-N04	1
Phoenix	Tetracaine hydrochloride	12K01-N04	1
gehe	Tetracaine hydrochloride	1303012	1
Fagron	Tetracaine hydrochloride	1303012-01	1
Phönix	Tetracaine hydrochloride	130301201	1

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Supplier	Substance	Batch	Spectra
Sanacorp	Tetracaine hydrochloride	1303012-01	1
BASF Pharma S.A.	Tetracaine hydrochloride	1310006-01	1
Caelo	Tetracaine hydrochloride	1310006-01	1
Phönix	Tetracaine hydrochloride	13155710	1
Fagron	Tetracaine hydrochloride	13D11-N01	1
Fagron	Tetracaine hydrochloride	13G02-N01	1
Fagron	Tetracaine hydrochloride	13k25-b04-290276	1
Fagron	Tetracaine hydrochloride	13K25-B04290276	1
Euro OTC	Tetracaine hydrochloride	20160812-2	1
Fagron	Tetracaine hydrochloride	13q11-n07	1
Fagron	Tetracaine hydrochloride	212131/221630-0002	1
Caelo	Tetracaine hydrochloride	27111305	1
Euro OTC	Tetracaine hydrochloride	2906009-02	1
Finze	Tetracaine hydrochloride	2906009-02	1
Euro OTC	Tetracaine hydrochloride	2906009V-03	1
EuRho	Tetracaine hydrochloride	2906009V-04	1
Euro OTC	Tetracaine hydrochloride	3113M-02039	1
Fagron	Tetracaine hydrochloride	3913I-02039	1
Fagron	Tetracaine hydrochloride	3413U02039	1
Fagron	Tetracaine hydrochloride	4313E-02039	1
Euro OTC	Tetracaine hydrochloride	140902601	1
Euro OTG Pharma	Tetracaine hydrochloride	1409026-02	1
Fagron	Tetracaine hydrochloride	14c18-B03-300200	1
Sanacorp, 21.02.17, 13,...	Tetracaine hydrochloride	1607031-01	1
Caelo	Tetracaine hydrochloride	1303012-01	2
Gutenberg-Apotheke	Tetracaine hydrochloride	13D11-N07	1
VDl 26.09.14 12,00 euro	Tetracaine hydrochloride	1405026-01	1
Euro OTC	Tetracaine hydrochloride	14090-26	1
Caelo	Tetracaine hydrochloride	14c18-b03-293966	1
Euro OTC	Tetracaine hydrochloride	14G14-B08-300202	1
Synopharm/Anzag	Tetracaine hydrochloride	2712Q-02039	1
Jenne	Tetracaine hydrochloride	13D11-No7	1

- 76 448 spectra from 463 *Apo-Ident* customers from a total of 25 394 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Tetracaine hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Tetracaine hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	230	0	72 203
Type B	0	308	37	161 728
Type C	0	657	54	76 448

The substance/substance group *Tetracaine hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.3913 %)
Type B	100.0000 % (> 99.9928 %)	89.2754 % (> 88.4058 %)
Type C	100.0000 % (> 99.8849 %)	92.4051 % (> 91.9831 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20924	21845	6.24	66.06
21845	21845	0.00	64.67
22285	22285	0.00	64.47
22912	22912	0.00	66.19
23162	22912	4.56	65.88
23163	21845	5.17	65.58

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Tetracycline hydrochloride**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20044-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Tetracycline hydrochloride; Tetracyclini hydrochloridum; Tetracyclinum hydrochloricum

Special notes

When selecting the *Tetracycline hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Tetracycline hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Tetracycline hyd…	1302012-01	21079	40	1411585
Caelo	Tetracycline hyd…	13201303	21427	39	20130807
Caelo	Tetracycline hyd…	13201303	21428	40	20130807
Euro OTC	Tetracycline hyd…	1506012	21835	40	20150707*
Caelo	Tetracycline hyd…	161167	22468	40	20160504*
Caelo	Tetracycline hyd…	15230712	22833	40	20150819

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 239 spectra of 6 reference samples from the substance/substance group *Tetracycline hydrochloride*. These samples are listed above in the section *calibration samples*. The reference samples originate from 5 different batches.

- 72 194 spectra from a total of 1577 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 220 spectra from 8 reference samples of the substance/substance group *Tetracycline hydrochloride*.

- These include spectra of independent samples from 4 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Tetracycline hydrochloride	09C25-N10	20044	30
Caelo	Tetracycline hydrochloride	13201303	21427†	20
Caelo	Tetracycline hydrochloride	13201303	21428†	20
Euro OTC	Tetracycline hydrochloride	1506012	21835†	20
Caelo	Tetracycline hydrochloride	161167	22468†	20
Euro OTC	Tetracycline hydrochloride	1603026	22545	40
Euro OTC	Tetracycline hydrochloride	1706020	23691	30
Caelo	Tetracycline hydrochloride	172858	23847	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 853 spectra from a total of 3492 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 266 spectra from 133 *Apo-Ident* customers from 83 batches from the substance/substance group *Tetracycline hydrochloride*.

- These include spectra of independent samples from 80 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Tetracycline hydrochloride	103201301	1
Caelo	Tetracycline hydrochloride	1017A-02378	1
Euro OTC	Tetracycline hydrochloride	1110029-01	4
EuRho/AHD	Tetracycline hydrochloride		1
Anzag/euRho	Tetracycline hydrochloride		1
Euro OTC	Tetracycline hydrochloride	1204039-02	13
Caelo	Tetracycline hydrochloride	12353603	6
Caelo	Tetracycline hydrochloride	12353613	1
Caelo	Tetracycline hydrochloride	12353616	1
Euro OTC	Tetracycline hydrochloride	1302012-01	10
Euro OTC	Tetracycline hydrochloride	1302012-02	18
Aliance am 10.03.2014	Tetracycline hydrochloride	1302012-02	1
Caelo	Tetracycline hydrochloride	1302012-02	1
EuRho	Tetracycline hydrochloride	1302012-02	1
Euro OTC	Tetracycline hydrochloride	13042015C	1
Fagron	Tetracycline hydrochloride	13201301	1
Caelo	Tetracycline hydrochloride	13201301	3
Caelo	Tetracycline hydrochloride	13201302	3
Caelo	Tetracycline hydrochloride	13201307	1
Celo/Kehr	Tetracycline hydrochloride	13201307	1
Alliance Health 22.08.2...	Tetracycline hydrochloride	13201307	1
Caelo	Tetracycline hydrochloride	13201309	2
Noweda	Tetracycline hydrochloride	13201307	1
Caelo	Tetracycline hydrochloride	13F17-N03	1
Fagron	Tetracycline hydrochloride	13F17-N03	4
Fagron	Tetracycline hydrochloride	13J22-N04	1
Fagron	Tetracycline hydrochloride	13L10-B02-294454	1
Fagron	Tetracycline hydrochloride	13L10-B02-294455	2
Caelo	Tetracycline hydrochloride	13L10B02296956	1
Euro OTC	Tetracycline hydrochloride	1402030-01	10
Phönix/Euro	Tetracycline hydrochloride	1402030-01	1
Caelo	Tetracycline hydrochloride	1402030-01	1
Euro OTC	Tetracycline hydrochloride	140203001	1
Euro OTC	Tetracycline hydrochloride	1402030-02	6
Sanacorp	Tetracycline hydrochloride	1402030-01	1
EuRho	Tetracycline hydrochloride	1402030-02	1
Fagron	Tetracycline hydrochloride	1402030-02	1
Caelo	Tetracycline hydrochloride	14080605	3

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Supplier	Substance	Batch	Spectra
Caelo	Tetracycline hydrochloride	14080606	2
Euro OTC	Tetracycline hydrochloride	14120007-01	2
Euro OTC	Tetracycline hydrochloride	1412007	1
Bombastus	Tetracycline hydrochloride	1412007-01	1
Euro OTC	Tetracycline hydrochloride	1412007-01	9
Caelo	Tetracycline hydrochloride	1412007-01	2
Caelo	Tetracycline hydrochloride	14364604	3
Euro OTC	Tetracycline hydrochloride	1412007-03	1
Caelo	Tetracycline hydrochloride	14364601	1
Hoff/ Noweda	Tetracycline hydrochloride	14364604	1
Caelo	Tetracycline hydrochloride	14364612	3
Caelo	Tetracycline hydrochloride	14364616	2
Caelo	Tetracycline hydrochloride	14364617	2
Fagron	Tetracycline hydrochloride	14H06-B05	2
Fagron	Tetracycline hydrochloride	14H06-B05-299498	1
Fagron	Tetracycline hydrochloride	14H06-B05-303911	1
Fagron	Tetracycline hydrochloride	14H06-B05-303912	3
Fagron	Tetracycline hydrochloride	14H06-B05-311707	1
Fagron	Tetracycline hydrochloride	14H06-B05-311/07	1
Caelo	Tetracycline hydrochloride	14H06-B05-313591	1
Fagron	Tetracycline hydrochloride	14H06-B05-314870	1
Fagron	Tetracycline hydrochloride	14H06-Bo5-303912	1
Euro OTC	Tetracycline hydrochloride	1506012-01	24
Fagron	Tetracycline hydrochloride	1506012-01	1
Caelo	Tetracycline hydrochloride	1506012-01	1
Caelo	Tetracycline hydrochloride	15230703	2
Gehe	Tetracycline hydrochloride	15230703	1
Caelo	Tetracycline hydrochloride	15230707	3
Caelo	Tetracycline hydrochloride	15230715	2
Caelo	Tetracycline hydrochloride	15230717	2
Euro OTC	Tetracycline hydrochloride	1603026	1
Euro OTC	Tetracycline hydrochloride	160302601	2
Caelo	Tetracycline hydrochloride	1603026-01	4
Euro OTC	Tetracycline hydrochloride	1603026-01	15
Bombastus	Tetracycline hydrochloride	1603026-01	2
Ningxia	Tetracycline hydrochloride	1603026-01	2
Ichthyol/Phönix	Tetracycline hydrochloride	1603026-01	1
Caelo	Tetracycline hydrochloride	16116701	1
Caelo	Tetracycline hydrochloride	16116706	1
Gehe	Tetracycline hydrochloride	16116706	1
Euro OTC	Tetracycline hydrochloride	21111404	1
Caelo	Tetracycline hydrochloride	2714U-02378	1
Caelo	Tetracycline hydrochloride	5091202	1
Caelo	Tetracycline hydrochloride	4012Q-02378	1
Sanacorp	Tetracycline hydrochloride	100403401	1
Euro OTC	Tetracycline hydrochloride	100518-62	1
Caelo	Tetracycline hydrochloride	9248704	1
Caelo	Tetracycline hydrochloride	4315I-02378	1
Euro OTC	Tetracycline hydrochloride	1103003-01	1
Gehe	Tetracycline hydrochloride	1110029-01	1
Caelo	Tetracycline hydrochloride	111002901	1
Euro OTC	Tetracycline hydrochloride	1204039-01	5
Noweda	Tetracycline hydrochloride	1204039-01	1
Caelo	Tetracycline hydrochloride	1204039	2
Euro OTC	Tetracycline hydrochloride	12040390	1
Kehr	Tetracycline hydrochloride	1110029-01	1
Europharm/Otto	Tetracycline hydrochloride	1204039-01	1
Europharm/Otto	Tetracycline hydrochloride	1204039-02	3
Eurho/Phoenix	Tetracycline hydrochloride	1204039-02	1
Euro OTC	Tetracycline hydrochloride	120403902	1

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Supplier	Substance	Batch	Spectra
200, 14.11.2012	Tetracycline hydrochloride	12138104	1
Caelo	Tetracycline hydrochloride	12138104	1
Caelo	Tetracycline hydrochloride	12353602	1
Caelo	Tetracycline hydrochloride	12138106	2
Anzag 30.04.2013	Tetracycline hydrochloride	12353602	1
Caelo	Tetracycline hydrochloride	12353609	1
Caelo	Tetracycline hydrochloride	12353612	2
Caelo	Tetracycline hydrochloride	1235613	1
Fagron	Tetracycline hydrochloride	12E10-N05	1
Fagron	Tetracycline hydrochloride	12J15-N05	1
Caelo	Tetracycline hydrochloride	1302012-01	1
Phönix Gotha	Tetracycline hydrochloride	1302012-01	1
Euro OTC	Tetracycline hydrochloride	140410-62	1
ningxia	Tetracycline hydrochloride	1412007-01	1
Euro OTC	Tetracycline hydrochloride	141200701	1
Euro OTC	Tetracycline hydrochloride	150601201	1
Euro OTC	Tetracycline hydrochloride	28021315	1
Caelo	Tetracycline hydrochloride	2612Q-02378	1
Caelo	Tetracycline hydrochloride	1103003-02	1
EUro/AHD	Tetracycline hydrochloride	1302012-01	1

- 76 893 spectra from 463 *Apo-Ident* customers from a total of 25 465 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Tetracycline hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Tetracycline hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	239	0	72 194
Type B	0	200	20	161 853
Type C	0	249	17	76 893

The substance/substance group *Tetracycline hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.4895 %)
Type B	100.0000 % (> 99.9928 %)	90.9091 % (> 89.5455 %)
Type C	100.0000 % (> 99.8850 %)	93.6090 % (> 92.4812 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to

exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21079	21079	0.00	28.06
21427	21835	6.70	29.95
21428	21835	2.78	29.88
21835	21835	0.00	29.01
22468	22468	0.00	28.11
22833	21079	5.98	29.30

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Thalidomide**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	21552-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Thalidomide; Thalidomidum

Special notes

When selecting the *Thalidomide* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Thalidomide*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Thalidomide	14E27B04295348	21552	40	1503608
Caelo	Thalidomide	13395704	21739	40	20140207
Caelo	Thalidomide	15276711	22880	40	1704508
Fagron	Thalidomide	15A13-B01-312230	22882	40	1704509

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 4 reference samples from the substance/substance group *Thalidomide*. These samples are listed above in the section *calibration samples*. The reference samples originate from 4 different batches.

- 72 273 spectra from a total of 1578 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 120 spectra from 4 reference samples of the substance/substance group *Thalidomide*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Thalidomide	14E27B04295348	21552†	20
Caelo	Thalidomide	13395704	21739†	20
Caelo	Thalidomide	162703	22774	40
Caelo	Thalidomide	172100	23684	40

- 161 953 spectra from a total of 3495 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 2 spectra from 2 *Apo-Ident* customers from 2 batches from the substance/substance group *Thalidomide*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Thalidomide	13K20-N01	1
Fagron	Thalidomide	14E27-B04-299297	1

- 77 157 spectra from 463 *Apo-Ident* customers from a total of 25 545 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Thalidomide* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Thalidomide* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	72 273
Type B	0	120	0	161 953
Type C	0	2	0	77 157

The substance/substance group *Thalidomide* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 95.0000 %)
Type C	100.0000 % (> 99.8856 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21552	21552	0.00	61.45
21739	21552	16.00	55.57
22880	22880	0.00	56.02
22882	22882	0.00	60.84

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Theophylline**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20723-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Theophylline; Theophyllinum

Special notes

When selecting the *Theophylline* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Theophylline*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Theophylline	12166316	20723	40	1402055
Caelo	Theophylline	12341101	21740	40	20121115

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 80 spectra of 2 reference samples from the substance/substance group *Theophylline*. These samples are listed above in the section *calibration samples*. The reference samples originate from 2 different batches.

- 72 353 spectra from a total of 1580 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 100 spectra from 3 reference samples of the substance/substance group *Theophylline*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Theophylline	12341101	21740†	20
Caelo	Theophylline	15203018	23253	40
Caelo	Theophylline	171962	23854	40

- 161 973 spectra from a total of 3496 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 13 spectra from 12 *Apo-Ident* customers from 9 batches from the substance/substance group *Theophylline*.

- These include spectra of independent samples from 8 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Theophylline	12341101	2
Caelo	Theophylline	15203010	1
Caelo	Theophylline	12341104	1
Noweda	Theophylline	12166305	1
Caelo	Theophylline	12166305	2
Caelo	Theophylline	12166306	1
Caelo	Theophylline	12166311	1
Caelo	Theophylline	12166312	1
Caesar&loretz,Phoenix	Theophylline	12166315	1
Caelo	Theophylline	12166315	1
Caelo	Theophylline	3912A-02382	1

- 77 146 spectra from 463 *Apo-Ident* customers from a total of 25 538 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Theophylline* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Theophylline* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	72 353
Type B	0	94	6	161 973
Type C	0	13	0	77 146

The substance/substance group *Theophylline* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9928 %)	94.0000 % (> 91.0000 %)
Type C	100.0000 % (> 99.8850 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20723	20723	0.00	79.88
21740	20723	7.94	77.30

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Theophylline-ethylenediamine hydrate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20831-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Theophylline-ethylenediamine hydrate; Theophyllinum aethylendiaminum hydricum; Theophyllinum et ethylendiaminum hydricum

Special notes

When selecting the *Theophylline-ethylenediamine hydrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Theophylline-ethylenediamine hydrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Theophylline-eth…	12145301	20831	40	20120628
Caelo	Theophylline-eth…	12363708	20992	40	20130116
Caelo	Theophylline-eth…	13268609	21549	40	1412133

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Theophylline-ethylenediamine hydrate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 110 spectra from 3 reference samples of the substance/substance group *Theophylline-ethylenediamine hydrate*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Theophylline-ethylenediamine…	15380302	22589	40
Caelo	Theophylline-ethylenediamine…	17073707	23564	30
Caelo	Theophylline-ethylenediamine…	172999	23823	40

- 161 963 spectra from a total of 3496 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details

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provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 2 spectra from 2 *Apo-Ident* customers from 2 batches from the substance/substance group *Theophylline-ethylenediamine hydrate*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Theophylline-ethylenediamine…	15380302	1
ACM / Phoenix	Theophylline-ethylenediamine…	KNC0896J14	1

- 77 157 spectra from 463 *Apo-Ident* customers from a total of 25 545 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Theophylline-ethylenediamine hydrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Theophylline-ethylenediamine hydrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	107	3	161 963
Type C	0	2	0	77 157

The substance/substance group *Theophylline-ethylenediamine hydrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	97.2727 % (> 94.5455 %)
Type C	100.0000 % (> 99.8856 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20831	21549	5.13	60.09
20992	21549	4.03	58.13
21549	21549	0.00	58.60

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Thiamine chloride hydrochloride**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20566-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Thiamine chloride hydrochloride; Aneurinum hydrochloricum; Thiamini hydrochloridum

Special notes

When selecting the *Thiamine chloride hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Thiamine chloride hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Thiamine chlorid…	14069502	21511	40	8986
Euro OTC	Thiamine chlorid…	1211008-02	21647	40	20121122
Caelo	Thiamine chlorid…	160156	22477	40	20160316*
Euro OTC	Thiamine chlorid…	1612004	22919	40	20170117*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 4 reference samples from the substance/substance group *Thiamine chloride - hydrochloride*. These samples are listed above in the section *calibration samples*. The reference samples originate from 4 different batches.

- 72 273 spectra from a total of 1578 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 520 spectra from 14 reference samples of the substance/substance group *Thiamine chloride hydrochloride*.

- These include spectra of independent samples from 9 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Thiamine chloride hydrochlor…	L11030345	20386	40
Euro OTC	Thiamine chloride hydrochlor…	1106001-01	20406	40
Euro OTC	Thiamine chloride hydrochlor…	1008026	20529	40
Euro OTC	Thiamine chloride hydrochlor…	1106001-01	20533	40
Caelo	Thiamine chloride hydrochlor…	10316406	20538	40
Fagron	Thiamine chloride hydrochlor…	12D16-N02	20566	40
Caelo	Thiamine chloride hydrochlor…	11371302	20570	40
Caelo	Thiamine chloride hydrochlor…	14069502	21478	60
Caelo	Thiamine chloride hydrochlor…	14069502	21511†	20
Euro OTC	Thiamine chloride hydrochlor…	1211008-02	21647†	20
Caelo	Thiamine chloride hydrochlor…	160156	22477†	20

continued on the next page

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Thiamine chloride hydrochlor…	170976	23368	40
Euro OTC	Thiamine chloride hydrochlor…	1705034	23439	40
Euro OTC	Thiamine chloride hydrochlor…	1712013	23911	40

- 161 553 spectra from a total of 3487 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 31 spectra from 13 *Apo-Ident* customers from 23 batches from the substance/substance group *Thiamine chloride hydrochloride*.

- These include spectra of independent samples from 22 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Thiamine chloride hydrochlor…	11371309	2
Caelo	Thiamine chloride hydrochlor…	4071402	1
Caelo	Thiamine chloride hydrochlor…	8121405	1
Fagron	Thiamine chloride hydrochlor…	10111401	1
Caelo	Thiamine chloride hydrochlor…	11061401	1
Caelo	Thiamine chloride hydrochlor…	12091407	1
Caelo	Thiamine chloride hydrochlor…	12340712	1
Sanacorp	Thiamine chloride hydrochlor…	12340712	1
Caelo	Thiamine chloride hydrochlor…	13296610	4
Fagron	Thiamine chloride hydrochlor…	13E22-No8	1
Caelo	Thiamine chloride hydrochlor…	14069502	1
Caelo	Thiamine chloride hydrochlor…	15003201	1
Caelo	Thiamine chloride hydrochlor…	15199009	2
Caelo	Thiamine chloride hydrochlor…	15199099	1
Fagron	Thiamine chloride hydrochlor…	190115006	1
Caelo	Thiamine chloride hydrochlor…	5122	1
Finze	Thiamine chloride hydrochlor…	9216114	1
Euro OTC	Thiamine chloride hydrochlor…	1106001-01	1
Caelo	Thiamine chloride hydrochlor…	11371313	1
Caelo	Thiamine chloride hydrochlor…	11371319	3
Caelo	Thiamine chloride hydrochlor…	3312A-01119	1
Euro OTC	Thiamine chloride hydrochlor…	1211008-01	1
Caelo	Thiamine chloride hydrochlor…		1
Euro OTC	Thiamine chloride hydrochlor…	L1305038-01	1

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

- 77 128 spectra from 463 *Apo-Ident* customers from a total of 25 525 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Thiamine chloride hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Thiamine chloride hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	72 273
Type B	0	440	80	161 553
Type C	0	28	3	77 128

The substance/substance group *Thiamine chloride hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9928 %)	84.6154 % (> 84.0385 %)
Type C	100.0000 % (> 99.8850 %)	90.3226 % (> 80.6452 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21511	21511	0.00	44.08
21647	22477	12.05	41.88
22477	22477	0.00	36.66
22919	22919	0.00	41.71

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Thymol**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20003-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Thymol; Thymolum

Special notes

When selecting the *Thymol* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Thymol*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Thymol	14025805	21469	40	20140127
Euro OTC	Thymol	1312022-02	21639	40	20131219
Euro OTC	Thymol	1510004	21943	40	20151016*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Thymol*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 250 spectra from 8 reference samples of the substance/substance group *Thymol*.

- These include spectra of independent samples from 5 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Thymol	82563169	20003	30
Caelo	Thymol	14025805	21469†	20
Euro OTC	Thymol	1312022-02	21639†	20
Euro OTC	Thymol	1510004	21943†	20
Caelo	Thymol	16144101	23160	40
Fagron	Thymol	15H13-B05-328912	23499	40
Euro OTC	Thymol	1710037	23773	40
Caelo	Thymol	173407	23837	40

- 161 823 spectra from a total of 3491 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 78 spectra from 61 *Apo-Ident* customers from 43 batches from the substance/substance group *Thymol*.

- These include spectra of independent samples from 42 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Thymol	2031503	1
Sanacorp	Thymol	9E14-N16	1
Caelo	Thymol	11178716	1
Caelo	Thymol	11178718	1
Caelo	Thymol	11358607	3
Phönix	Thymol	11358610	1
Sanacorp	Thymol	1135816	1
Caelo	Thymol	11358610	1
Caelo	Thymol	11358608	1
Caelo	Thymol	11358616	2
Euro OTC	Thymol	1202028-01	2
Fagron	Thymol	12B06-N11	2
Fagron	Thymol	12E30-N11	1
Fagron	Thymol	12D04-N04	1
Fagron	Thymol	12H29-N02	3
Fagron	Thymol	12K01-N02	3
Fagron	Thymol	12M29-N02	1
Noweda	Thymol	12k01-no2	1
Frey+Lau GmbH/Phönix	Thymol	1312022-01	1
Euro OTC	Thymol	1312022-01	1
Gehe Kassel	Thymol	1312022-01	1
Caelo	Thymol	13147502	2
Caelo	Thymol	13288802	4
Caesar § Lorenz GmbH	Thymol	13288806	1
PHOENIX 26.03.2014	Thymol	14025802	2
Caelo	Thymol	14025802	2
	Thymol	14025802	1
Caelo	Thymol	14025805	1
Caelo	Thymol	14025809	2
Caelo	Thymol	14025807	1
Caelo	Thymol	14025815	2
Caelo	Thymol	14025816	1
Euro OTC	Thymol	1410007-01	5
Caelo	Thymol	14302401	1
Caelo	Thymol	14310601	1
Euro OTC	Thymol	1510004-01	1
Caelo	Thymol	14310605	1
Phönix	Thymol	1510004-01	1
Euro OTC	Thymol	1510004-02	5
Caelo	Thymol	15130101	2
Caelo	Thymol	15130106	1
Caelo	Thymol	15362901	3
Ebert & Jacobi 02.08...	Thymol	15362901	1

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Supplier	Substance	Batch	Spectra
Caelo	Thymol	15362908	1
Caelo	Thymol	15362910	1
Caelo	Thymol	16144105	1
Caelo	Thymol	19061303	1
Euro OTC	Thymol	20151012-1	1
Fagron	Thymol	713575	1
ACM / Herba	Thymol	KNC1166J14	1

- 77 081 spectra from 463 *Apo-Ident* customers from a total of 25 504 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Thymol* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Thymol* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	249	1	161 823
Type C	0	74	4	77 081

The substance/substance group *Thymol* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	99.6000 % (> 98.4000 %)
Type C	100.0000 % (> 99.8850 %)	94.8718 % (> 91.0256 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

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Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21469	21943	15.73	49.23
21639	21943	22.51	51.23
21943	21943	0.00	57.94

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Tobramycin sulfate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	`20951-2018-07-18`
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Tobramycin sulfate; Tobramycin sulphate; Tobramycini sulfas; Tobramycinum sulfuricum

Special notes

When selecting the *Tobramycin sulfate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Tobramycin sulfate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Tobramycin sulfate	`12G03-N03`	20951	40	`1404541`
Euro OTC	Tobramycin sulfate	`1301011-02`	21624	40	`1508071`
Euro OTC	Tobramycin sulfate	`1505015-01`	21832	40	`8963`
Euro OTC	Tobramycin sulfate	`1510035-01`	22240	40	`9202`
Euro OTC	Tobramycin sulfate	`1510035`	22252	40	`20151208`*

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Tobramycin sulfate	15I17-B04-315697	22359	30	20150928
Audor	Tobramycin sulfate	AP15061047002T	22393	40	1608462
Fagron	Tobramycin sulfate	16B05-B03-336397	23515	40	1801385

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 310 spectra of 8 reference samples from the substance/substance group *Tobramycin sulfate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 8 different batches.

- 72 123 spectra from a total of 1574 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 355 spectra from 10 reference samples of the substance/substance group *Tobramycin sulfate*.

- These include spectra of independent samples from 1 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Tobramycin sulfate	1301011-02	21624†	20
Euro OTC	Tobramycin sulfate	1505015-01	21832†	20
Euro OTC	Tobramycin sulfate	1510035-01	22240†	20
Euro OTC	Tobramycin sulfate	1510035	22252†	20
Fagron	Tobramycin sulfate	15I17-B04-315697	22359†	15
Audor Pharma	Tobramycin sulfate	AP15061047002T	23502	40

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*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Tobramycin sulfate	1710029	23870	40
Euro OTC	Tobramycin sulfate	1505015-01	21832SI	60
Euro OTC	Tobramycin sulfate	1510035-01	22240SI	60
Euro OTC	Tobramycin sulfate	1510035	22252SI	60

- 161 718 spectra from a total of 3492 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 20 spectra from 7 *Apo-Ident* customers from 13 batches from the substance/substance group *Tobramycin sulfate*.

- These include spectra of independent samples from 10 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
PHOENIX 31.01.2014	Tobramycin sulfate	1202006-01	1
Fagron	Tobramycin sulfate	13H09-N09	1
Fagron	Tobramycin sulfate	15/17-B04-315697	1
Euro OTC	Tobramycin sulfate	1505015-01	1
Euro OCT/Noweda	Tobramycin sulfate	1510035-01	1
Fagron	Tobramycin sulfate	15I17-B04	1
Euro OTC	Tobramycin sulfate	15I17-B04-315697	1
Fagron	Tobramycin sulfate	16B05-B03	5
Fagron	Tobramycin sulfate	16B05-B03-317988	2
Fagron	Tobramycin sulfate	16B05-B03-319433	1
Fagron	Tobramycin sulfate	16B05-B03-330974	2
Fagron	Tobramycin sulfate	17E05-B03-338122	2
Fagron	Tobramycin sulfate	16C04-B06	1

- 77 139 spectra from 463 *Apo-Ident* customers from a total of 25 534 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Tobramycin sulfate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose,

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

all relevant spectra of the various substances were compared with *Tobramycin sulfate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	310	0	72 123
Type B	0	317	38	161 718
Type C	0	18	2	77 139

The substance/substance group *Tobramycin sulfate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9887 %)	100.0000 % (> 98.0645 %)
Type B	100.0000 % (> 99.9928 %)	89.2958 % (> 88.4507 %)
Type C	100.0000 % (> 99.8850 %)	90.0000 % (> 75.0000 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20951	20951	0.00	10.76
21624	21624	0.00	14.96
21832	21832	0.00	18.08
22240	22240	0.00	36.24
22252	22252	0.00	17.89
22359	21832	8.48	19.93
22393	22393	0.00	9.76
23515	23515	0.00	22.36

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Tosylchloramide sodium**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20133-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Tosylchloramide sodium; Chloraminum; Tosylchloramidum natricum

Special notes

When selecting the *Tosylchloramide sodium* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Tosylchloramide sodium*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Tosylchloramide ...	13103201	20864	40	20130424
Caelo	Tosylchloramide ...	13361602	21115	40	1407634
Caelo	Tosylchloramide ...	16236603	23562	40	20160819

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Tosylchloramide sodium*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 140 spectra from 3 reference samples of the substance/substance group *Tosylchloramide sodium*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Tosylchloramide sodium	09359512	20133	40
Caelo	Tosylchloramide sodium	13361606	21480	60
Caelo	Tosylchloramide sodium	162366	22773	40

- 161 933 spectra from a total of 3496 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

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- 85 spectra from 37 *Apo-Ident* customers from 44 batches from the substance/substance group *Tosylchloramide sodium*.

- These include spectra of independent samples from 42 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Tosylchloramide sodium	13103206	9
Caelo	Tosylchloramide sodium	13361606	4
Caelo	Tosylchloramide sodium	13103210	4
Caelo	Tosylchloramide sodium	13103207	3
Caelo	Tosylchloramide sodium	13361607	6
Caelo	Tosylchloramide sodium	13361608	2
Caelo	Tosylchloramide sodium	14183505	1
Phoenix goettin	Tosylchloramide sodium	14183509	1
Fagron	Tosylchloramide sodium	14L12-B01-301915	1
Euro OTC	Tosylchloramide sodium	14B27-B03-29401	1
Caelo	Tosylchloramide sodium	14183509	1
Fagron	Tosylchloramide sodium	14B27-B3-294701	1
Fagron	Tosylchloramide sodium	14B27-B03-291967	1
Caelo	Tosylchloramide sodium	15039603	3
Fagron	Tosylchloramide sodium	15039602	1
Caelo	Tosylchloramide sodium	15183905	2
Caelo	Tosylchloramide sodium	15370505	1
Caelo	Tosylchloramide sodium	15370501	3
Caelo	Tosylchloramide sodium	16236603	1
Caeolo	Tosylchloramide sodium	16236607	1
Fagron	Tosylchloramide sodium	181970-003	1
Caelo	Tosylchloramide sodium	16236607	1
Caelo	Tosylchloramide sodium	71051187	2
Caelo	Tosylchloramide sodium	11/07-N06	1
Fagron	Tosylchloramide sodium	11L08-N04	1
Caelo	Tosylchloramide sodium	11210803	1
Fagron	Tosylchloramide sodium	11J07-N06	1
Caelo	Tosylchloramide sodium	11116709	1
Caelo	Tosylchloramide sodium	72215377	2
Fagron	Tosylchloramide sodium	11D19-N05	1
Caelo	Tosylchloramide sodium	11116708	1
Fagron	Tosylchloramide sodium	11L08-N04	1
Fagron	Tosylchloramide sodium	12/22-B02-288834	1
Caelo	Tosylchloramide sodium	12277005	3
Caelo	Tosylchloramide sodium	12323605	2
Caelo	Tosylchloramide sodium	12323601	1
Caelo	Tosylchloramide sodium	12323606	1
Caelo	Tosylchloramide sodium	12323607	2
Synopharm am 10.09.2012	Tosylchloramide sodium	12323607	1
Caelo	Tosylchloramide sodium	12323609	2
Caelo	Tosylchloramide sodium	12323608	1
Sanacorp	Tosylchloramide sodium	12H09-N01	1
Caelo	Tosylchloramide sodium	13103201	2
Anzag	Tosylchloramide sodium	12H09-N01	1
Caelo	Tosylchloramide sodium	13103202	1
PHOENIX am 12.06.2012	Tosylchloramide sodium	181970-0001	1
Fagron	Tosylchloramide sodium	Ch12H09-N01	2
Fagron	Tosylchloramide sodium	12H09-N01	1
Caelo	Tosylchloramide sodium	1310206	1

- 77 074 spectra from 463 *Apo-Ident* customers from a total of 25 503 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Tosylchloramide sodium* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Tosylchloramide sodium* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	129	11	161 933
Type C	0	75	10	77 074

The substance/substance group *Tosylchloramide sodium* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	92.1429 % (> 90.0000 %)
Type C	100.0000 % (> 99.8850 %)	88.2353 % (> 84.7059 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20864	21115	10.37	28.74
21115	21115	0.00	31.57
23562	21115	6.21	31.87

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Tranexamic acid**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20397-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Tranexamic acid; Acidum tranexamicum

Special notes

When selecting the *Tranexamic acid* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Tranexamic acid*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Tranexamic acid	14C21-B08-292225	21654	40	AR-17-FG-016394-01
Fagron	Tranexamic acid	14L15-B06-3000036	21727	40	AR-15-FG-008937-02
Fagron	Tranexamic acid	16E31-B07-331591	23505	40	20160622

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Tranexamic acid*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 170 spectra from 5 reference samples of the substance/substance group *Tranexamic acid*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Tranexamic acid	11J11-N05	20397	40
Fagron	Tranexamic acid	14C21-B08-292225	21654†	20
Fagron	Tranexamic acid	14L15-B06-3000036	21727†	20
Fagron	Tranexamic acid	16E31-B07-331591	23503	50
Audor Pharma	Tranexamic acid	APX1508016MT	23504	40

- 161 903 spectra from a total of 3494 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 15 spectra from 10 *Apo-Ident* customers from 13 batches from the substance/substance group *Tranexamic acid*.

- These include spectra of independent samples from 13 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Tranexamic acid	13D08-N24	1
Fagron	Tranexamic acid	13Do8-N24	1
Fagron	Tranexamic acid	13K08-B04-287966	1
Fagron	Tranexamic acid	15J29-B04	1
Audor Pharma	Tranexamic acid	1508016MT	1
Fagron	Tranexamic acid	13D08-N240002/40	1
Fagron	Tranexamic acid	15J29-B04-312372	1
Caelo	Tranexamic acid	15J29-B04	1
Fagron	Tranexamic acid	16B03-B02-319617	1
Audor Pharma	Tranexamic acid	APX1508016MT	1
Audor Pharma	Tranexamic acid	APX1712011MT	2
Fagron	Tranexamic acid	12D11-N02	1
Fagron	Tranexamic acid	13G24-N21	1
Caelo	Tranexamic acid	20110429	1

- 77 144 spectra from 463 *Apo-Ident* customers from a total of 25 535 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Tranexamic acid* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Tranexamic acid* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	170	0	161 903
Type C	0	15	0	77 144

The substance/substance group *Tranexamic acid* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 96.4706 %)
Type C	100.0000 % (> 99.8850 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21654	21654	0.00	79.74
21727	21727	0.00	85.70
23505	21654	2.32	80.76

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Tretinoin**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20474-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Tretinoin; Tretinoinum

Special notes

When selecting the *Tretinoin* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Tretinoin*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Tretinoin	1402007-02	21747	40	1507085
Caelo	Tretinoin	15028403	21757	40	1507086
Caelo	Tretinoin	15239503	21878	20	20150717
Euro OTC	Tretinoin	1510007	21940	40	20151102*
Euro OTC	Tretinoin	1604059	22574	40	20160603*

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Tretinoin	15F01-B06-317884	22936	40	20150619
Euro OTC	Tretinoin	1402007-02	21747SI	40	1507085
Caelo	Tretinoin	15028403	21757SI	40	1507086
Caelo	Tretinoin	15239503	21878SI	40	20150717
Euro OTC	Tretinoin	1510007	21940SI	40	20151102*
Fagron	Tretinoin	15F01-B06-317884	22936SI	40	20150619

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 420 spectra of 11 reference samples from the substance/substance group *Tretinoin*. These samples are listed above in the section *calibration samples*. The reference samples originate from 6 different batches.

- 72 013 spectra from a total of 1576 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 861 spectra from 25 reference samples of the substance/substance group *Tretinoin*.

- These include spectra of independent samples from 10 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Tretinoin	09364503	20195	41
zu erfassen	Tretinoin	zu erfassen	20220	40
Fagron	Tretinoin	11A27-N01	20239	40

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*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Tretinoin	11284703	20474	40
Euro OTC	Tretinoin	1402007-02	21747†	20
Caelo	Tretinoin	15028403	21757†	20
Caelo	Tretinoin	15239503	21878†	40
Euro OTC	Tretinoin	1510007	21940†	20
Caelo	Tretinoin	162915	22779	40
Caelo	Tretinoin	162171	22780	40
Euro OTC	Tretinoin	1612010	22911	40
Caelo	Tretinoin	172731	23680	40
Caelo	Tretinoin	173057	23843	40
Euro OTC	Tretinoin	1804005	24061	40
Euro OTC	Tretinoin	1402007-02	21747SI†	20
Caelo	Tretinoin	15028403	21757SI†	20
Caelo	Tretinoin	15239503	21878SI†	20
Euro OTC	Tretinoin	1510007	21940SI†	20
Euro OTC	Tretinoin	1604059	22574SI	40
Caelo	Tretinoin	162915	22779SI	40
Caelo	Tretinoin	162171	22780SI	40
Euro OTC	Tretinoin	1612010	22911SI	40
Caelo	Tretinoin	172731	23680SI	40
Caelo	Tretinoin	173057	23843SI	40
Euro OTC	Tretinoin	1804005	24061SI	40

- 161 212 spectra from a total of 3485 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 389 spectra from 193 *Apo-Ident* customers from 138 batches from the substance/substance group *Tretinoin*.

- These include spectra of independent samples from 135 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Euro OTC	Tretinoin	12959AX20	2
Euro OTC	Tretinoin	1304028-01	8
EuRho/Sanacorp	Tretinoin	130402802	1
Euro OTC	Tretinoin	1304028-02	9
Nachprüfung	Tretinoin		1
Caelo	Tretinoin	13278102	6
Caelo	Tretinoin	13308004	5
Sanacorp	Tretinoin	13308004	1
Fagron	Tretinoin	13A08-N07	2

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†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Supplier	Substance	Batch	Spectra
Fagron	Tretinoin	13B05-B02-287360	6
Caelo	Tretinoin	13B05-B02-287360	1
Fagron	Tretinoin	13B05-B02-287361	2
Fagron	Tretinoin	13C11-N06	2
Fagron	Tretinoin	13D30-N14	3
Fagron	Tretinoin	13D30N14	1
Euro OTC	Tretinoin	14020007-01	1
Euro OTC	Tretinoin	1402007	1
Euro OTC	Tretinoin	140200701	1
Euro OTC	Tretinoin	1402007-01	6
Fargron	Tretinoin	1402007-01	1
Euro OTC	Tretinoin	1402007-02	8
Phönix	Tretinoin	1402007-02	1
Euro OTC	Tretinoin	1402007-03	4
Bombastus	Tretinoin	1402007-03	1
BASF	Tretinoin	1402007-03	1
Caelo	Tretinoin	14040504	6
Fagron	Tretinoin	14040504	1
Caelo	Tretinoin	14040507	1
Caelo	Tretinoin	14093502	4
Caelo	Tretinoin	14093503	2
Fagron	Tretinoin	14093505	1
Euro OTC	Tretinoin	14101602	1
Sanacorp	Tretinoin	1411016-01	1
Euro OTC	Tretinoin	1411016-01	11
Caelo	Tretinoin	1411016-01	1
Fagron	Tretinoin	1411016-01	1
Eurimpharm	Tretinoin	1411016-01	1
Sanacorp	Tretinoin	1411016-02	1
Euro OTC	Tretinoin	141101602	1
Euro OTC	Tretinoin	1411016-02	8
Euro	Tretinoin	14111016-01	1
Euro OTC	Tretinoin	141107602	1
Caelo	Tretinoin	14252702	3
Caelo	Tretinoin	14252706	2
Caelo	Tretinoin	14252710	2
Caelo	Tretinoin	14252801	2
Caelo	Tretinoin	1452802	1
Fagron	Tretinoin	14D09-B04	1
Phönix	Tretinoin	14D09-B04	2
Phönix	Tretinoin	14D09-B04-293224	1
Fagron	Tretinoin	14D09-B04-293225	1
Fagron	Tretinoin	14D09-B04-293224	1
Fagron	Tretinoin	14D09-B04-293594	1
Fargron	Tretinoin	14D09-B04-293225	1
Fagron	Tretinoin	14D09-B04-295551	1
Fagron	Tretinoin	14L24-B01-303157	4
Fagron	Tretinoin	14L24-B01	1
Caelo	Tretinoin	14L24-B01-303157	1
Caelo	Tretinoin	15078301	1
Caelo	Tretinoin	15078302	2
Caelo	Tretinoin	15078303	2
Anzag/Henry Lamotte	Tretinoin	15078303	1
Anzag	Tretinoin	15078305	1
Caelo	Tretinoin	15078305	1
Noweda	Tretinoin	15078307	1
Caelo	Tretinoin	15078307	3
Caelo	Tretinoin	15078308	1
Caelo	Tretinoin	1510007-01	1
Euro OTC	Tretinoin	1510007-01	9

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Supplier	Substance	Batch	Spectra
Caelo	Tretinoin	151000701	1
Euro OTC	Tretinoin	1510007-02	8
Fagron	Tretinoin	1510007-02	1
Caelo	Tretinoin	1510007-02	1
Caelo	Tretinoin	15239501	1
Caelo	Tretinoin	15239502	5
Caelo	Tretinoin	15239503	2
Caelo	Tretinoin	15437303	5
Fagron	Tretinoin	15F01-B06-308722	2
Celo	Tretinoin	15437303	1
Sanacorp	Tretinoin	15F01-B06-308722	1
Fagron	Tretinoin	15F01-B06-308856	2
Caelo	Tretinoin	15F01-B06-308856	1
Fagron	Tretinoin	15F01-B06-313216	1
Noweda	Tretinoin	15F01-B06-315491	1
Fagron	Tretinoin	15F01-B06-315491	1
Fagron	Tretinoin	15F01-B06-317884	1
Euro OTC	Tretinoin	16004059-02	1
Euro OTC	Tretinoin	1604059-01	10
Caelo	Tretinoin	16070002	3
Euro OTC	Tretinoin	1604059-02	4
Caelo	Tretinoin	16070001	1
Euro OTC	Tretinoin	1612010-01	4
Caelo	Tretinoin	1612010-01	3
Caelo	Tretinoin	16291502	2
Caelo	Tretinoin	16291503	4
Euro OTC	Tretinoin	165070002	1
Fagron	Tretinoin	16F14-B04	1
Noweda	Tretinoin	1008021-02	1
gehe	Tretinoin	11225511	1
Caelo	Tretinoin	1517E-02563	1
Caelo	Tretinoin	1604059-02	1
Gehe	Tretinoin	1612010-01	1
phönix	Tretinoin	1612010-01	1
Euro OTC	Tretinoin	1612010-02	1
Euro OTC	Tretinoin	161210-01	1
Caelo	Tretinoin	16217108	1
Fagron	Tretinoin	16F14B-04	1
Fagron	Tretinoin	16F14B04325560	1
Fagron	Tretinoin	16F14-B04-326181	1
Caelo	Tretinoin	16F14-B04-326181	1
Fagron	Tretinoin	16K03-B06	1
Caelo	Tretinoin	17106101	1
Gatt-Koller	Tretinoin	606210909	1
Euro OTC	Tretinoin	10429AX21	1
Caelo	Tretinoin	3041302	1
Caelo	Tretinoin	711212563	1
Euro OTC	Tretinoin	1008021-02	1
Euro OTC	Tretinoin	1109014-02	3
Caelo	Tretinoin	1109014-02	1
FARGON	Tretinoin	11a27-n01	1
Phoenix am 19.06.2012	Tretinoin	11K01-N02	1
Fagron	Tretinoin	11K29-N01	1
Phönis 08.03.13	Tretinoin	11K29-N01	1
Sanacorp	Tretinoin	12/06-N01	1
Caelo	Tretinoin	12023302	12
Noweda	Tretinoin	12023302	2
Caesar & Loretz GmbH, 4...	Tretinoin	12023302	1
Caelo	Tretinoin	12023309	1
Caelo	Tretinoin	12102902	1

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Supplier	Substance	Batch	Spectra
Caelo	Tretinoin	12102903	4
Caelo	Tretinoin	12320205	5
Caelo	Tretinoin	12320207	2
Caelo	Tretinoin	12320303	1
Caelo	Tretinoin	12367101	2
Caelo	Tretinoin	12367103	3
Caelo	Tretinoin	12367104	1
Fagron	Tretinoin	12D05-N08	2
Caelo	Tretinoin	12D05-N08	1
Caelo	Tretinoin	12I06-N01	1
Großhandel	Tretinoin	12I06-N01	1
Fagron	Tretinoin	12I06-N01	3
Fagron	Tretinoin	12l06-N01	1
Euro OTC	Tretinoin	130102802	1
BASF/Phönix	Tretinoin	1304028-02	2
Caelo	Tretinoin	1304028-02	3
Euro OTC	Tretinoin	130402802	1
Euro OTC	Tretinoin	13041028-01	1
Caelo	Tretinoin	13195002	16
cealo	Tretinoin	13195002	1
Caelo	Tretinoin	13278101	1
Caelo	Tretinoin	13278104	3
Caelo	Tretinoin	13278105	3
Caelo	Tretinoin	13308003	1
Noweda	Tretinoin	13D30-N14	1
Fagron	Tretinoin	1410001594	1
Euro OTC	Tretinoin	14110116-02	1
Caelo	Tretinoin	14093504	1
Fagron	Tretinoin	1440104	1
Caelo	Tretinoin	20120601	1
Fagron	Tretinoin	20120601	1
Caelo	Tretinoin	412051/4	1
Caelo	Tretinoin	5012I-02563	1
Phönix	Tretinoin	1109014-02	1
Caelo	Tretinoin	16F14-B04	1
Caelo	Tretinoin	11225511	1
Caelo	Tretinoin	11k29-n01	1
Caelo	Tretinoin	12320203	3
Phoenix	Tretinoin	12367103	1
Fagron	Tretinoin	13D30-N14-3365319091	1
Caelo	Tretinoin	11225506	2
Kehr	Tretinoin	1109014-01	1
Caelo	Tretinoin	13195008	2
Fagron	Tretinoin	14009-804	1
Phoenix	Tretinoin	15F01-B06-317884	1
Caelo	Tretinoin	11225504	1
Euro OTC	Tretinoin	30042014A	1
Caesar & Loretz GmbH	Tretinoin	11225515	1
Caelo	Tretinoin	11284703	1
Caelo	Tretinoin	12023303	1
Caelo	Tretinoin	12102904	2
Caelo	Tretinoin	12320201	2
Caelo	Tretinoin	12320204	1
Caelo	Tretinoin	12320209	6
Caesar & Loretz GmbH	Tretinoin	12320211	1
Kehr	Tretinoin	12320301	1
Caelo	Tretinoin	12320301	1
Sanacorp	Tretinoin	12320302	1
Caelo	Tretinoin	131950002	1
Sanacorp	Tretinoin	13195002	1

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Supplier	Substance	Batch	Spectra
Caelo	Tretinoin	395002	1

- 76 770 spectra from 463 *Apo-Ident* customers from a total of 25 411 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Tretinoin* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Tretinoin* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	420	0	72 013
Type B	0	858	3	161 212
Type C	0	289	100	76 770

The substance/substance group *Tretinoin* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9887 %)	100.0000 % (> 98.5714 %)
Type B	100.0000 % (> 99.9928 %)	99.6516 % (> 99.3031 %)
Type C	100.0000 % (> 99.8849 %)	74.2931 % (> 73.5219 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21747	21747	0.00	45.14
21757	21757	0.00	47.07
21878	21747	11.26	48.66

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Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21940	21940	0.00	47.70
22574	22574	0.00	48.09
22936	21940	2.36	47.28

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Triamcinolon, micronized**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20564-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Triamcinolon, micronized; Triamcinolonum micronisatum

Special notes

When selecting the *Triamcinolon, micronized* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Triamcinolon, micronized*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Triamcinolon, mi…	12A03-N09	20730	40	20120117
Fagron	Triamcinolon, mi…	12K07-N13	20936	80	AR-15-FG-003373-01
Caelo	Triamcinolon, mi…	15106905	22273	30	20150527
Fagron	Triamcinolon, mi…	14B13-B30-316101	22840	40	20140311
Fagron	Triamcinolon, mi…	17G03-B04-343670	24097	40	20171101
Fagron	Triamcinolon, mi…	17G03-B04-343670	24097SI	40	20171101

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 270 spectra of 6 reference samples from the substance/substance group *Triamcinolon, micronized*. These samples are listed above in the section *calibration samples*. The reference samples originate from 5 different batches.

- 72 163 spectra from a total of 1577 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 125 spectra from 4 reference samples of the substance/substance group *Triamcinolon, micronized*.

- These include spectra of independent samples from 1 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Triamcinolon, micronized	12A03-N09	20564	40
Caelo	Triamcinolon, micronized	15106905	22273†	15
Caelo	Triamcinolon, micronized	15106905	22605	40
Caelo	Triamcinolon, micronized	15106911	23508	30

- 161 948 spectra from a total of 3496 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 33 spectra from 23 *Apo-Ident* customers from 23 batches from the substance/substance group *Triamcinolon, micronized*.

- These include spectra of independent samples from 21 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Sanacorp	Triamcinolon, micronized	100/AKD6	1
Caelo	Triamcinolon, micronized	12295207	1
Caelo	Triamcinolon, micronized	12295210	2
Fagron	Triamcinolon, micronized	12F01-N19	4
Fagron	Triamcinolon, micronized	12D02-N14	1
Fagron	Triamcinolon, micronized	12K07-N13	1
Fagron	Triamcinolon, micronized	13C26-N04	2
Fagron	Triamcinolon, micronized	13D30-N15	2
Caelo	Triamcinolon, micronized	13J07-N08	2
Fagron	Triamcinolon, micronized	14B13-B30	1
Noweda 24.08.2015	Triamcinolon, micronized	14B13-B30-293474	1
Fagron	Triamcinolon, micronized	14B13-B30-293474	1
Fagron	Triamcinolon, micronized	14B13-B30-312868	1
Caelo	Triamcinolon, micronized	15106902	2
Caelo	Triamcinolon, micronized	15106960	1
Fagron	Triamcinolon, micronized	15B13-B30-312868	1
Fagron	Triamcinolon, micronized	16A13-B06	1
Caelo	Triamcinolon, micronized	AKD15	1
Phönix	Triamcinolon, micronized	NS0608M	1
Fagron	Triamcinolon, micronized	11D28-N04	1
Fagron	Triamcinolon, micronized	11G26-N04	1
Caelo	Triamcinolon, micronized	12146612	1
Fagron	Triamcinolon, micronized	12A03-N09	2
Fagron	Triamcinolon, micronized	12Do2-N14	1

- 77 126 spectra from 463 *Apo-Ident* customers from a total of 25 526 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Triamcinolon, micronized* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Triamcinolon, micronized* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	190	80	72 163
Type B	0	85	40	161 948
Type C	0	28	5	77 126

The substance/substance group *Triamcinolon, micronized* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	70.3704 % (> 69.2593 %)
Type B	100.0000 % (> 99.9928 %)	68.0000 % (> 65.6000 %)
Type C	100.0000 % (> 99.8850 %)	84.8485 % (> 75.7576 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20730	20936	19.41	45.44
20936	20936	0.00	52.30
22273	20936	3.39	51.89
22840	20936	11.41	47.44
24097	20936	126.91	20.01

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Triamcinolone acetonide**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20765-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Triamcinolone acetonide; Triamcinoloni acetonidum; Triamcinolonum acetonatum

Special notes

When selecting the *Triamcinolone acetonide* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Triamcinolone acetonide*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Triamcinolone ac…	12E15-N03	20765	40	1412051
Euro OTC	Triamcinolone ac…	1303001-02	20910	40	20130815
Caelo	Triamcinolone ac…	13256607	21061	80	AR-15-FG-003755-01
Euro OTC	Triamcinolone ac…	1211013-02	21072	30	20130417
Caelo	Triamcinolone ac…	13379921	21587	40	1503634

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Triamcinolone ac...	1508008	21883	40	20150902*
Fagron	Triamcinolone ac...	15C19-B06-308572	21962	40	20150402
Euro OTC	Triamcinolone ac...	1601021	22313	30	20160119*
Euro OTC	Triamcinolone ac...	1605010	22572	40	20160531*
Euro OTC	Triamcinolone ac...	1608005	22752	40	20160906*
Euro OTC	Triamcinolone ac...	1605010	22572SI	25	20160531*
Euro OTC	Triamcinolone ac...	1608005	22752SI	22	20160906*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 467 spectra of 12 reference samples from the substance/substance group *Triamcinolone acetonide*. These samples are listed above in the section *calibration samples*. The reference samples originate from 10 different batches.

- 71 966 spectra from a total of 1572 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 831 spectra from 28 reference samples of the substance/substance group *Triamcinolone acetonide*.

- These include spectra of independent samples from 11 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Triamcinolone acetonide	80890079	20007	20

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*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Triamcinolone acetonide	12E15-N03	20765†	10
Caelo	Triamcinolone acetonide	12301505	20769	50
Fagron	Triamcinolone acetonide	13C13-N20	21043	40
Caelo	Triamcinolone acetonide	13379921	21587†	20
Euro OTC	Triamcinolone acetonide	1508008	21883†	20
Fagron	Triamcinolone acetonide	15C19-B06-308572	21962†	20
Euro OTC	Triamcinolone acetonide	1601021	22313†	15
Caelo	Triamcinolone acetonide	160945	22473	60
Euro OTC	Triamcinolone acetonide	1612014	22978	40
Caelo	Triamcinolone acetonide	171206	23330	40
Caelo	Triamcinolone acetonide	171206	23343	40
Euro OTC	Triamcinolone acetonide	1703037	23393	38
Euro OTC	Triamcinolone acetonide	1706013	23557	40
Euro OTC	Triamcinolone acetonide	1710002	23694	40
Euro OTC	Triamcinolone acetonide	1801020	23883	40
Caelo	Triamcinolone acetonide	181002	24016	40
Euro OTC	Triamcinolone acetonide	1508008	21883SI	30
Fagron	Triamcinolone acetonide	15C19-B06-308572	21962SI	19
Caelo	Triamcinolone acetonide	160945	22473SI	40
Euro OTC	Triamcinolone acetonide	1612014	22978SI	29
Caelo	Triamcinolone acetonide	171206	23330SI	20
Caelo	Triamcinolone acetonide	171206	23343SI	20
Euro OTC	Triamcinolone acetonide	1703037	23393SI	20
Euro OTC	Triamcinolone acetonide	1706013	23557SI	20
Euro OTC	Triamcinolone acetonide	1710002	23694SI	20
Euro OTC	Triamcinolone acetonide	1801020	23883SI	20
Caelo	Triamcinolone acetonide	181002	24016SI	20

- 161 242 spectra from a total of 3483 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 1547 spectra from 352 *Apo-Ident* customers from 367 batches from the substance/substance group *Triamcinolone acetonide*.

- These include spectra of independent samples from 357 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Triamcinolone acetonide	13124805	10
Euro OTC	Triamcinolone acetonide	3022015A	1
Euro OTC	Triamcinolone acetonide	3051402	1
Fagron	Triamcinolone acetonide	4111408	1

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†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Supplier	Substance	Batch	Spectra
Caelo	Triamcinolone acetonide	6051401	1
Fagron	Triamcinolone acetonide	7041501	1
Sanacorp	Triamcinolone acetonide	100/AKD4	1
Caelo	Triamcinolone acetonide	100/AKD2	1
Euro OTC	Triamcinolone acetonide	1008005-01	1
Caelo	Triamcinolone acetonide	102/AKD11	1
Caelo	Triamcinolone acetonide	102/AKD12	1
Fagron	Triamcinolone acetonide	11K11-N10	7
Fagron	Triamcinolone acetonide	12/-N09	1
Caelo	Triamcinolone acetonide	1203160l	1
Caelo	Triamcinolone acetonide	1206008-01	1
Euro OTC	Triamcinolone acetonide	1211013-01	9
Euro OTC	Triamcinolone acetonide	1211013-02	13
Caelo	Triamcinolone acetonide	12173703	1
Caelo	Triamcinolone acetonide	12301502	1
Caelo	Triamcinolone acetonide	12301505	1
Fargon/Anzag	Triamcinolone acetonide	13/26-N11	3
Fagron	Triamcinolone acetonide	13/26-N11	7
Fagron	Triamcinolone acetonide	1326-N11	1
Fargron	Triamcinolone acetonide	13/26-N11	1
Euro OTC	Triamcinolone acetonide	1303001-02	8
Euro OTC	Triamcinolone acetonide	1307043-01	16
Euro OTC	Triamcinolone acetonide	1307043-02	13
EuRho/Phönix	Triamcinolone acetonide	1307043-02	1
Caelo	Triamcinolone acetonide	13124801	6
Caelo	Triamcinolone acetonide	13124804	16
Caelo	Triamcinolone acetonide	13124807	11
Caelo	Triamcinolone acetonide	13124808	15
Gepepharm/Noweda	Triamcinolone acetonide	13124808	1
Caelo	Triamcinolone acetonide	13124809	2
Caelo	Triamcinolone acetonide	13124811	5
Caelo	Triamcinolone acetonide	13124810	4
Caelo	Triamcinolone acetonide	13256603	2
Fagron	Triamcinolone acetonide	13126-N11	1
Caelo	Triamcinolone acetonide	13256604	7
Caelo	Triamcinolone acetonide	13256607	6
Caelo	Triamcinolone acetonide	13256606	1
Caelo	Triamcinolone acetonide	13256608	2
Sanacorp	Triamcinolone acetonide	1326N11	1
Phönix	Triamcinolone acetonide	13379902	1
Caelo	Triamcinolone acetonide	13379902	1
Caelo	Triamcinolone acetonide	13379903	2
Caelo	Triamcinolone acetonide	13379901	1
VDL	Triamcinolone acetonide	13379903	1
Caelo	Triamcinolone acetonide	13379904	6
Caelo	Triamcinolone acetonide	13379905	17
Martinus-Apotheke	Triamcinolone acetonide	13379905	1
Sanacorp	Triamcinolone acetonide	13379905	1
Caesar & Loretz GmbH Hi…	Triamcinolone acetonide	13379905	1
Caelo	Triamcinolone acetonide	13379906	10
Caelo	Triamcinolone acetonide	13379911	2
Caelo	Triamcinolone acetonide	13379912	12
Caelo	Triamcinolone acetonide	13379913	4
Caelo	Triamcinolone acetonide	13379914	7
Caelo	Triamcinolone acetonide	13379919	1
Caelo	Triamcinolone acetonide	13379922	1
Caelo	Triamcinolone acetonide	13379921	1
Caelo	Triamcinolone acetonide	1355101	1
Fagron	Triamcinolone acetonide	13c13-n20	2
Fagron	Triamcinolone acetonide	13C13-N20	17

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Supplier	Substance	Batch	Spectra
Fagron	Triamcinolone acetonide	13E15-N03	53
Fagron	Triamcinolone acetonide	13E15N03	3
Phönix	Triamcinolone acetonide	13E15-N03	1
Fagron	Triamcinolone acetonide	13E15-NO3	1
Fagron	Triamcinolone acetonide	13I26-N11	17
Caelo	Triamcinolone acetonide	13I26-N11	1
Fagron	Triamcinolone acetonide	13I26N11	1
Fagron	Triamcinolone acetonide	13I26-N26	1
Fagron	Triamcinolone acetonide	13K14-B04	4
Fagron	Triamcinolone acetonide	13K14-b04	1
Fagron	Triamcinolone acetonide	13K14-B04-289032	5
Fagron	Triamcinolone acetonide	13K14-B04-289033	10
Caelo	Triamcinolone acetonide	13K14-B04-289033	2
Fagron	Triamcinolone acetonide	13K15-B31-289031	6
Fagron	Triamcinolone acetonide	13K15-B31	8
Bombastus	Triamcinolone acetonide	13K15-B31	2
Fagron	Triamcinolone acetonide	13K15-B31-289025	1
Fagron	Triamcinolone acetonide	13K15-B31-289027	6
Caelo	Triamcinolone acetonide	13K15-B31-289027	2
Phönix	Triamcinolone acetonide	13K15-B31-289027	1
Noweda	Triamcinolone acetonide	13K15-B31-289029	1
Fagron	Triamcinolone acetonide	13K15B31289029	1
Fagron	Triamcinolone acetonide	13K15-B31-289029	4
Apomix/Phönix	Triamcinolone acetonide	13k15-b31-289029	2
Caelo	Triamcinolone acetonide	13K15-B31-289029	1
Fagron	Triamcinolone acetonide	13k15-b31-289030	1
Fargon	Triamcinolone acetonide	13K15-B31-289030	1
Fagron	Triamcinolone acetonide	13K15B31289031	1
Caelo	Triamcinolone acetonide	13K15-B31-289031	1
Phoenix	Triamcinolone acetonide	13l26-N11	2
Euro OTC	Triamcinolone acetonide	14030009-01	2
Euro OTC	Triamcinolone acetonide	14030009-02	1
euroct/gehe	Triamcinolone acetonide	1403009	1
Euro OTC	Triamcinolone acetonide	1403009-01	8
Fagron	Triamcinolone acetonide	1403009-01	1
Phönix	Triamcinolone acetonide	1403009-01	1
Newchem/ Noweda	Triamcinolone acetonide	1403009-01	1
Euro OTC	Triamcinolone acetonide	1403009-02	13
euroct/gehe	Triamcinolone acetonide	1403009-02	1
EuRho	Triamcinolone acetonide	1403009-02	1
EuRho/Phoenix	Triamcinolone acetonide	1403009-02	1
Euro OTC	Triamcinolone acetonide	1407044-01	9
EuRho/Phönix	Triamcinolone acetonide	1407044-01	1
Newchem/Kehr	Triamcinolone acetonide	1407044-01	1
Phönix	Triamcinolone acetonide	1407044-01	1
Bombastus	Triamcinolone acetonide	140704401	1
Fagron	Triamcinolone acetonide	1407044-01	1
Noweda	Triamcinolone acetonide	1407044-01	1
Euro OTC	Triamcinolone acetonide	1407044-02	17
Euro OTC	Triamcinolone acetonide	14120130	1
Euro OTC	Triamcinolone acetonide	1412013-01	14
Euro OTC	Triamcinolone acetonide	141201301	1
Euro OTC	Triamcinolone acetonide	1412013-02	7
Euro OTC	Triamcinolone acetonide	141201302	3
Euro OTC	Triamcinolone acetonide	141213-02	1
Caelo	Triamcinolone acetonide	14188301	1
Caelo	Triamcinolone acetonide	14188302	4
Caelo	Triamcinolone acetonide	14188303	6
Euro OTC	Triamcinolone acetonide	14188304	1
Caelo	Triamcinolone acetonide	14188304	4

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Supplier	Substance	Batch	Spectra
Caelo	Triamcinolone acetonide	14233904	1
Caelo	Triamcinolone acetonide	14255104	1
Caelo	Triamcinolone acetonide	14355101	16
Berkel AHK	Triamcinolone acetonide	14355101	3
AHD 06.03.15 9,47	Triamcinolone acetonide	14355102	2
Caelo	Triamcinolone acetonide	14355102	15
Caelo	Triamcinolone acetonide	14355103	10
Anzag	Triamcinolone acetonide	14355103	1
Noweda	Triamcinolone acetonide	14355103	1
Caelo	Triamcinolone acetonide	14355104	4
Fagron	Triamcinolone acetonide	14355104	1
Caelo	Triamcinolone acetonide	14355701	1
Caelo	Triamcinolone acetonide	14355702	14
Caelo	Triamcinolone acetonide	14355703	3
Caelo	Triamcinolone acetonide	14355704	2
Caelo	Triamcinolone acetonide	14355706	1
Caelo	Triamcinolone acetonide	14355708	9
Phoenix	Triamcinolone acetonide	14355708	1
Noweda	Triamcinolone acetonide	14355708	1
Fagron	Triamcinolone acetonide	14355709	1
Caelo	Triamcinolone acetonide	14355709	1
Phoenix	Triamcinolone acetonide	14355709	1
Caelo	Triamcinolone acetonide	14355711	9
Anzag	Triamcinolone acetonide	14355711	1
Phönix Gotha	Triamcinolone acetonide	14355711	1
AHD	Triamcinolone acetonide	14355711	1
Caelo	Triamcinolone acetonide	14355712	5
Fagron	Triamcinolone acetonide	14F30-B01	2
Fagron	Triamcinolone acetonide	14F30B01	1
Fagron	Triamcinolone acetonide	14F30-B01-296287	3
Fagron	Triamcinolone acetonide	14F30-B021-296287	1
Caelo	Triamcinolone acetonide	14G23B072976618	1
Fagron	Triamcinolone acetonide	14G23-B07	1
Fagron	Triamcinolone acetonide	14G23-B07-297618	3
Fagron	Triamcinolone acetonide	14G23-B07-297619	2
Caelo	Triamcinolone acetonide	14G23-B07-297619	1
Fagron	Triamcinolone acetonide	14G23-B07-297620	7
Fagron	Triamcinolone acetonide	14k14-B05-302887	1
Fagron	Triamcinolone acetonide	14K14-B05-302887	2
Euro OTC	Triamcinolone acetonide	1504007-01	12
NEWCHEM / Sanacorp	Triamcinolone acetonide	15040007-01	1
Euro OTC	Triamcinolone acetonide	150400701	2
Euro OTC	Triamcinolone acetonide	1504007-02	13
Caelo	Triamcinolone acetonide	1504007-01	1
Euro OTC	Triamcinolone acetonide	15041007-02	1
Euro OTC	Triamcinolone acetonide	15042014A	1
Caelo	Triamcinolone acetonide	1508008-01	2
Euro OTC	Triamcinolone acetonide	1508008-01	12
Euro OTC	Triamcinolone acetonide	1508008-02	12
EuRho	Triamcinolone acetonide	1508008-02	2
Sittig	Triamcinolone acetonide	1508008-02	1
Euro OTC	Triamcinolone acetonide	150800802	2
Caelo	Triamcinolone acetonide	1508008-02	1
Caelo	Triamcinolone acetonide	1514Q2516	1
Caelo	Triamcinolone acetonide	15233901	16
Farmabios S.p.A./Caesar…	Triamcinolone acetonide	15233901	1
Caelo	Triamcinolone acetonide	15233902	23
AHD/Hedinger	Triamcinolone acetonide	15233902	1
Sanacorp	Triamcinolone acetonide	15233902	2
Noweda	Triamcinolone acetonide	15233902	1

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Supplier	Substance	Batch	Spectra
Caelo	Triamcinolone acetonide	15233903	15
Noweda	Triamcinolone acetonide	15233903	1
Caelo	Triamcinolone acetonide	15233904	17
Euro OTC	Triamcinolone acetonide	15233904	1
Caelo	Triamcinolone acetonide	15233905	6
Caelo	Triamcinolone acetonide	15233906	13
Euro OTC	Triamcinolone acetonide	15233906	2
phönix	Triamcinolone acetonide	15233906	1
Caelo	Triamcinolone acetonide	15233908	3
Audor Pharma	Triamcinolone acetonide	15240T	1
Euro OTC	Triamcinolone acetonide	15404007-01	1
Caelo	Triamcinolone acetonide	15430101	2
Caelo	Triamcinolone acetonide	15430102	3
Gehe	Triamcinolone acetonide	15430102	1
Caelo	Triamcinolone acetonide	15430103	2
Caelo	Triamcinolone acetonide	15430105	8
Caelo	Triamcinolone acetonide	15430106	4
Caelo	Triamcinolone acetonide	15430107	7
phönix	Triamcinolone acetonide	15430107	1
Sanacorp	Triamcinolone acetonide	15430108	1
Caelo	Triamcinolone acetonide	15430108	4
Fagron	Triamcinolone acetonide	15B02-B03	4
Newchem S.p.A./Caesar &...	Triamcinolone acetonide	1543015	1
Fagron	Triamcinolone acetonide	15B02-B03-303827	2
Fagron	Triamcinolone acetonide	15B02-B03-303828	3
Fargon/Alliance HC	Triamcinolone acetonide	15B02-B03-303830	1
Fagron	Triamcinolone acetonide	15B02-B03-303830	7
Fagron	Triamcinolone acetonide	15BO2-B03-303828	1
Caelo	Triamcinolone acetonide	15C19-B06-308571	1
Fagron	Triamcinolone acetonide	15C19-B06	1
Fagron	Triamcinolone acetonide	15C19-B06-308572	5
Fagron	Triamcinolone acetonide	15C19-B06-308571	1
Fargon	Triamcinolone acetonide	15C19-B06-308572	2
Caelo	Triamcinolone acetonide	15C19-B06-308573	1
Newchem/Noweda	Triamcinolone acetonide	15C19-B06-308573	1
Fagron	Triamcinolone acetonide	15C19-B06-308573	7
Fagron	Triamcinolone acetonide	15C19-B06-309194	1
Fagron	Triamcinolone acetonide	15G31B07	1
Fagron	Triamcinolone acetonide	15G31-B07	1
Fagron	Triamcinolone acetonide	15G31-B07-313596	4
Fagron	Triamcinolone acetonide	15G31-B07-313597	6
Caelo	Triamcinolone acetonide	15G31-B07-313597	1
Fagron	Triamcinolone acetonide	15G31-B07-314045	4
Fagron	Triamcinolone acetonide	15g31-b07-314046	1
Fagron	Triamcinolone acetonide	15G31-B07-314047	1
Fagron	Triamcinolone acetonide	15G31-B07-314046	2
Fagron	Triamcinolone acetonide	15L21-B03	1
Fagron	Triamcinolone acetonide	15L21-B03-316123	4
Caelo	Triamcinolone acetonide	15L21-B03-316123	1
Euro OTC	Triamcinolone acetonide	15L21-B03-316123	2
Fagron	Triamcinolone acetonide	15L21-B03-318663	3
Caelo	Triamcinolone acetonide	15L21-B03-318663	1
EuRho	Triamcinolone acetonide	1601021-01	1
Euro OTC	Triamcinolone acetonide	1601021-01	23
Caelo	Triamcinolone acetonide	160102101	1
Euro OTC	Triamcinolone acetonide	160501001	1
Caelo	Triamcinolone acetonide	160501001	1
Euro OTC	Triamcinolone acetonide	1605010-01	20
Caelo	Triamcinolone acetonide	1605010-01	2
phönix	Triamcinolone acetonide	1605010-01	1

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Supplier	Substance	Batch	Spectra
Noweda	Triamcinolone acetonide	1605010-01	1
Newchem/Fiebig	Triamcinolone acetonide	1605010-01	1
Allianz Healthcare	Triamcinolone acetonide	16080005-01	1
Euro OTC	Triamcinolone acetonide	1608005	1
Euro OTC	Triamcinolone acetonide	1608005-01	15
Caelo	Triamcinolone acetonide	1608005-01	1
Caelo	Triamcinolone acetonide	16092504	8
Calo/Sanacorp	Triamcinolone acetonide	16092504	1
Sanacorp	Triamcinolone acetonide	16094501	1
Caelo	Triamcinolone acetonide	16094501	10
Bombastus	Triamcinolone acetonide	16094501	1
Gehe	Triamcinolone acetonide	16094501	1
Caelo	Triamcinolone acetonide	16094504	1
Caelo	Triamcinolone acetonide	16094505	1
Caelo	Triamcinolone acetonide	16094506	3
Caelo	Triamcinolone acetonide	16094507	2
Caelo	Triamcinolone acetonide	16094511	11
Caelo	Triamcinolone acetonide	16094512	4
Caelo	Triamcinolone acetonide	16094514	3
Euro OTC	Triamcinolone acetonide	1612014-01	28
Euro/Noweda	Triamcinolone acetonide	161201401	1
EuRho / Phoenix	Triamcinolone acetonide	1612014-01	1
Ebert/Euo	Triamcinolone acetonide	1612014-01	1
Caelo	Triamcinolone acetonide	1612014-01	2
Fagron	Triamcinolone acetonide	16B04-B07	1
Fagron	Triamcinolone acetonide	16B04-B07-318664	3
Fagron	Triamcinolone acetonide	16B04-B07-318957	3
Fagron	Triamcinolone acetonide	16B04-B07-319471	3
Fagron	Triamcinolone acetonide	16D04-B11-325479	1
Fagron	Triamcinolone acetonide	16D14-B11	1
Caelo	Triamcinolone acetonide	16D14-B11	1
Fagron	Triamcinolone acetonide	16D14-B11-321318	3
Fagron	Triamcinolone acetonide	16D14-B11-322135	2
Fagron	Triamcinolone acetonide	16D14-B11-322136	3
AHD 22.12.16 EK 29,74	Triamcinolone acetonide	16D14B11322136	1
Fagron	Triamcinolone acetonide	16D14-B11-322158	2
Fagron	Triamcinolone acetonide	16D14-B11-325479	2
Gehe/Fragon	Triamcinolone acetonide	16D14-B11-325479	1
Fagron	Triamcinolone acetonide	16D14B11325479	1
Fagron	Triamcinolone acetonide	16D14-B11-325480	3
Fagron	Triamcinolone acetonide	16D14-B11-325481	2
Fagron	Triamcinolone acetonide	16D14-B11-325482	1
Fagron	Triamcinolone acetonide	16K07-B06	1
Fagron	Triamcinolone acetonide	16F07-B06	1
Fagron	Triamcinolone acetonide	16K07-B06-329446	2
Fagron	Triamcinolone acetonide	16K07-B06-329445	1
Caelo	Triamcinolone acetonide	16K07-B06-333438	1
Fagron	Triamcinolone acetonide	16K07-B06-332101	1
Newchem Spa (site)	Triamcinolone acetonide	16K07-B06-332102	1
Caelo	Triamcinolone acetonide	170303701	1
Euro OTC	Triamcinolone acetonide	1703037-01	2
Phoenix	Triamcinolone acetonide	1703037-01	1
Caelo	Triamcinolone acetonide	17057901	1
Caelo	Triamcinolone acetonide	17057902	5
Caelo	Triamcinolone acetonide	17057903	2
Caelo	Triamcinolone acetonide	17057905	2
Caesar & Loretz GmbH	Triamcinolone acetonide	17057906	1
Caelo	Triamcinolone acetonide	17057906	4
Caelo	Triamcinolone acetonide	17057907	1
Caesar & Loretz GmbH	Triamcinolone acetonide	17057907	1

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Caelo	Triamcinolone acetonide	17057908	4
Euro OTC	Triamcinolone acetonide	17061406	1
Euro OTC	Triamcinolone acetonide	1710002-01	1
Caelo	Triamcinolone acetonide	17120603	1
Caelo	Triamcinolone acetonide	17120605	2
Caelo	Triamcinolone acetonide	17120606	4
Caelo	Triamcinolone acetonide	17120608	1
Fagron	Triamcinolone acetonide	17C09-B01-334196	2
Fagron	Triamcinolone acetonide	17C09-B01-337464	1
Fagron	Triamcinolone acetonide	17C09-B01-340173	1
Euro OTC	Triamcinolone acetonide	26081405	1
Euro OTC	Triamcinolone acetonide	29011503	1
Fagron	Triamcinolone acetonide	289027	1
Euro OTC	Triamcinolone acetonide	29081501	1
Euro OTC	Triamcinolone acetonide	31101414	1
euro/ Anzag	Triamcinolone acetonide	3315I02516	1
Caelo	Triamcinolone acetonide	5430105	1
Fagron	Triamcinolone acetonide	700124-0004	1
Audor Pharma	Triamcinolone acetonide	APB0544/112020T	1
Euro OTC	Triamcinolone acetonide	APB0544/112020T	1
AUDOER/ Alliance Health...	Triamcinolone acetonide	APBO544/112020T	1
Audor Pharma	Triamcinolone acetonide	APU0544/315240T	2
Anzag	Triamcinolone acetonide	APB0544/112020T	1
Audor Pharma	Triamcinolone acetonide	APUO544/31524T	1
Oberlinden Apotheke	Triamcinolone acetonide	B0544/114010	1
Fagron	Triamcinolone acetonide	NT077oM	1
Fagron	Triamcinolone acetonide	NT1094M	1
Fagron	Triamcinolone acetonide	NT1430M	3
AHD 03.03.2015	Triamcinolone acetonide	NT1430M	1
Fagron	Triamcinolone acetonide	NU0930M	1
NEWCHEM S.P.A.	Triamcinolone acetonide	NV0994M	1
Fagron	Triamcinolone acetonide	NVO262M	2
Fagron	Triamcinolone acetonide	Nw0635M	1
Euro OTC	Triamcinolone acetonide	NW2518M	1
Eigen/Defektur	Triamcinolone acetonide	U0544/113530	1
Audor Pharma	Triamcinolone acetonide	U0544/315240T	1
Oberlinden-Apotheke	Triamcinolone acetonide	U0544/1	1
Caelo	Triamcinolone acetonide	1811211	1
Caelo	Triamcinolone acetonide	3041206	1
Fagron	Triamcinolone acetonide	5061205	1
Fagron	Triamcinolone acetonide	5061303	1
Fagron	Triamcinolone acetonide	5121302	1
Fagron	Triamcinolone acetonide	7H30-N03	1
Euro OTC	Triamcinolone acetonide	80616-5	1
Caelo	Triamcinolone acetonide	9081305	1
Fagron	Triamcinolone acetonide	9041305	1
Caelo	Triamcinolone acetonide	9364429	2
Euro OTC	Triamcinolone acetonide	1013I-02516	1
Caelo	Triamcinolone acetonide	10220311	1
Caelo	Triamcinolone acetonide	10220332	1
Caelo	Triamcinolone acetonide	10220340	2
Caelo	Triamcinolone acetonide	10220341	1
Caelo	Triamcinolone acetonide	10220342	1
Euro OTC	Triamcinolone acetonide	1110004-01	1
Caelo	Triamcinolone acetonide	1107212516	1
Anzag, 24.10.2012	Triamcinolone acetonide	1110004-01	1
Euro OTC	Triamcinolone acetonide	1110005-01	4
Caelo	Triamcinolone acetonide	1110005-01	1
Fagron	Triamcinolone acetonide	11101208	1
Euro OTC	Triamcinolone acetonide	111005-01	1

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Euro OTC	Triamcinolone acetonide	1112023-01	3
Euro OTC	Triamcinolone acetonide	1112023-02	10
Noweda	Triamcinolone acetonide	1112023-02	1
Caelo	Triamcinolone acetonide	11267704	1
Caesar&loretz,Phoenix	Triamcinolone acetonide	11267705	1
Caelo	Triamcinolone acetonide	11267705	1
Caelo	Triamcinolone acetonide	11267707	4
Caelo	Triamcinolone acetonide	11267706	1
Caelo	Triamcinolone acetonide	11267710	2
Phönix Gotha	Triamcinolone acetonide	11267711	1
Caelo	Triamcinolone acetonide	11267711	1
anzag am 29.06.2012	Triamcinolone acetonide	11267720	1
Caelo	Triamcinolone acetonide	11267720	1
Gehe	Triamcinolone acetonide	11267721	1
Caelo	Triamcinolone acetonide	11267714	1
Caelo	Triamcinolone acetonide	11267721	4
Fagron	Triamcinolone acetonide	11E24-N04	2
Fagron	Triamcinolone acetonide	11B22-N05	1
Caelo	Triamcinolone acetonide	11K11-N10	1
Fagron	Triamcinolone acetonide	12/10-N09	5
Gehe	Triamcinolone acetonide	12/10-N09	2
Caelo	Triamcinolone acetonide	12/10-N09	3
Caelo	Triamcinolone acetonide	1201506	1
Euro OTC	Triamcinolone acetonide	1206008-01	5
Europharm/Otto	Triamcinolone acetonide	1206008-01	1
Fagron	Triamcinolone acetonide	120600801	1
Euro OTC	Triamcinolone acetonide	1209040-01	5
Caelo	Triamcinolone acetonide	1209040-01	1
Gehe/Phönix	Triamcinolone acetonide	1209040-02	1
Euro OTC	Triamcinolone acetonide	1209040-02	4
Europharm/Otto	Triamcinolone acetonide	1209040-02	1
Caelo	Triamcinolone acetonide	120904002	1
Caelo	Triamcinolone acetonide	1210-n09	1
Caelo	Triamcinolone acetonide	1211013-01	1
Europharm/Sanacorp	Triamcinolone acetonide	1211013-01	3
Gehe	Triamcinolone acetonide	1211013-01	2
EuRho/Phönix	Triamcinolone acetonide	1211013-01	1
GEHE	Triamcinolone acetonide	1211013-02	1
Noweda/ NEWCHEM	Triamcinolone acetonide	1211013-02	1
A.H. 07.05.13 ek: 7,25EUR	Triamcinolone acetonide	1211013-02	1
euro	Triamcinolone acetonide	1211013-02	1
Caelo	Triamcinolone acetonide	1217307	1
Euro OTC	Triamcinolone acetonide	121113-02	1
Caelo	Triamcinolone acetonide	12173701	8
Caesar&loretz,Phoenix	Triamcinolone acetonide	12173703	1
Caelo	Triamcinolone acetonide	12173704	2
Caelo	Triamcinolone acetonide	12173705	6
Fagron	Triamcinolone acetonide	12173705	1
Caelo	Triamcinolone acetonide	12173707	6
Phönix 28.03.2013	Triamcinolone acetonide	12173707	1
Caelo	Triamcinolone acetonide	12173710	5
Noweda	Triamcinolone acetonide	12301501	1
Gehe	Triamcinolone acetonide	122301508	1
Caelo	Triamcinolone acetonide	12301501	4
Caesar&loretz,Phoenix	Triamcinolone acetonide	12301502	1
Caelo	Triamcinolone acetonide	12301503	1
Fagron	Triamcinolone acetonide	12301503	1
Caelo	Triamcinolone acetonide	12301504	3
Noweda	Triamcinolone acetonide	12301506	1
Caelo	Triamcinolone acetonide	12301506	1

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Sanacorp	Triamcinolone acetonide	12301506	1
Caelo	Triamcinolone acetonide	12301507	6
Euro OTC	Triamcinolone acetonide	12301507	1
Phoenix 11.03.2013	Triamcinolone acetonide	12301508	1
Caelo	Triamcinolone acetonide	12301508	4
Caelo	Triamcinolone acetonide	12301509	5
Caelo	Triamcinolone acetonide	12301510	4
Caelo	Triamcinolone acetonide	12301515	16
Otto Fischar	Triamcinolone acetonide	12301517	1
Ph.Eur.7,0	Triamcinolone acetonide	12301518	1
Caelo	Triamcinolone acetonide	12301518	4
Noveda	Triamcinolone acetonide	12301518	1
Kehr	Triamcinolone acetonide	1267708	1
Fagron	Triamcinolone acetonide	12B08-N01	8
Fagron	Triamcinolone acetonide	12B08N01	1
Fagron	Triamcinolone acetonide	12E15/N03	1
Fagron	Triamcinolone acetonide	12E15-N03	27
Gehe	Triamcinolone acetonide	12E15-N03	2
Großhandel	Triamcinolone acetonide	12E15-N03	1
Noweda	Triamcinolone acetonide	12E15-N03	1
Caelo	Triamcinolone acetonide	12E15-N03	2
Phönix	Triamcinolone acetonide	12E15-N03	1
Euro OTC	Triamcinolone acetonide	12G6008-01	1
Fagron	Triamcinolone acetonide	12I10-N09	6
Hirsch	Triamcinolone acetonide	12I10-N09	2
Fagron	Triamcinolone acetonide	12l10-N09	3
Fagron	Triamcinolone acetonide	13021408	1
Euro OTC	Triamcinolone acetonide	13030001-01	1
Euro OTC	Triamcinolone acetonide	13030001-02	1
Euro OTC	Triamcinolone acetonide	1303001-01	5
Euro OTC	Triamcinolone acetonide		1
Caelo	Triamcinolone acetonide	1303001-02	2
Gehe	Triamcinolone acetonide	1303001-02	1
Anzag	Triamcinolone acetonide	1303001-02	1
Euro	Triamcinolone acetonide	1303001-02	1
Newchem	Triamcinolone acetonide	1303001-02	2
Euro OTC	Triamcinolone acetonide	1307043-03	1
Fagron	Triamcinolone acetonide	13121201	1
Caelo	Triamcinolone acetonide	1312407	1
Caelo	Triamcinolone acetonide	13124803	4
Gehe	Triamcinolone acetonide	13124803	1
phönix	Triamcinolone acetonide	13124803	1
Gehe	Triamcinolone acetonide	13124805	1
Caelo	Triamcinolone acetonide	13124806	3
Sanacorp	Triamcinolone acetonide	13124807	2
Caesar & Loretz GmbH Hi...	Triamcinolone acetonide	13124807	1
noweda	Triamcinolone acetonide	13256604	1
Fagron	Triamcinolone acetonide	13C13-20	1
fargon	Triamcinolone acetonide	13C13-N20	1
Alliance Healthcare	Triamcinolone acetonide	13C13-N20	2
Apotheke Mildenau	Triamcinolone acetonide	13C13-N20	1
Caelo	Triamcinolone acetonide	13C13-N20	2
Caelo	Triamcinolone acetonide	13E15-N03	1
Caelo	Triamcinolone acetonide	13e15-n03	2
Gehe	Triamcinolone acetonide	13E15-N03	2
Sanacorp	Triamcinolone acetonide	13E15-N03	1
Großhandel	Triamcinolone acetonide	13E15-N03	1
Fagron	Triamcinolone acetonide	13E15-No3	1
Gehe	Triamcinolone acetonide	13I26-N11	1
	Triamcinolone acetonide	1403009-01	1

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Supplier	Substance	Batch	Spectra
Phönix	Triamcinolone acetonide	14355703	1
Fagron	Triamcinolone acetonide	14K24N-N01	1
EuRho	Triamcinolone acetonide	150800-08-02	1
apoident	Triamcinolone acetonide	1508008-01	1
Fagron	Triamcinolone acetonide	16011407	1
Caelo	Triamcinolone acetonide	1802212516	1
EuRho/Noweda	Triamcinolone acetonide	1601021-01	1
Fagron	Triamcinolone acetonide	20031302	1
Caelo	Triamcinolone acetonide	1601312516	1
Euro OTC	Triamcinolone acetonide	20130912-5	1
Caelo	Triamcinolone acetonide	2513M02516	1
Fagron	Triamcinolone acetonide		1
Fagron	Triamcinolone acetonide	3212U-02516(NP)	1
Fagron	Triamcinolone acetonide	411082-1-P	1
Caelo	Triamcinolone acetonide	93/AD1	1
Audor Pharma	Triamcinolone acetonide	APB0544/11101	2
Caelo	Triamcinolone acetonide	95/AKD34	1
Gehe	Triamcinolone acetonide	700124-0007	1
Caelo	Triamcinolone acetonide	4613E2516	1
Audor Pharma	Triamcinolone acetonide	APB0544/111010T	3
Europharm/Sanacorp	Triamcinolone acetonide	B0544/111040	2
Euro OTC	Triamcinolone acetonide	B0544/111404	1
Fagron	Triamcinolone acetonide	C22H25CIN209	1
Caelo	Triamcinolone acetonide		1
Caelo	Triamcinolone acetonide	Ch-B11267704	1
Caelo	Triamcinolone acetonide	NS0571M	1
Fagron	Triamcinolone acetonide	NS0571M	5
Fagron	Triamcinolone acetonide	NS0996M	2
Klenk	Triamcinolone acetonide	NS1680M	1
Fagron	Triamcinolone acetonide	NS2571M	1
Fagron	Triamcinolone acetonide	NSO571M	1
Euro OTC	Triamcinolone acetonide	NV0635M	1
Euro OTC	Triamcinolone acetonide	NV2998M	1
Oberlinden- Apotheke	Triamcinolone acetonide	U0544/113530	1
Euro OTC	Triamcinolone acetonide	PT49	1
Herbasinica	Triamcinolone acetonide	1110005-01	1
Caelo	Triamcinolone acetonide	9364422	1
Fagron	Triamcinolone acetonide	11N11-N10	1
Fagron	Triamcinolone acetonide	1210-N09	1
A.H.D.	Triamcinolone acetonide	12301508	1
Euro OTC	Triamcinolone acetonide	130704301	1

- 75 612 spectra from 463 *Apo-Ident* customers from a total of 25 184 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Triamcinolone acetonide* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Triamcinolone acetonide* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

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	False positive	True positive	False negative	True negative
Type A	0	467	0	71 966
Type B	0	831	0	161 242
Type C	0	1516	31	75 612

The substance/substance group *Triamcinolone acetonide* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9887 %)	100.0000 % (> 98.7152 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 99.2780 %)
Type C	100.0000 % (> 99.8849 %)	97.9961 % (> 97.8022 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20765	20765	0.00	8.81
20910	21061	4.20	6.92
21061	21061	0.00	7.76
21072	21061	1.71	9.97
21587	21587	0.00	5.92
21883	21883	0.00	6.90
21962	21587	4.23	7.16
22313	22313	0.00	7.66
22572	22572	0.00	18.38
22752	22752	0.00	6.54

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Triclosan**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20005-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Triclosan; Triclosanum

Special notes

When selecting the *Triclosan* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Triclosan*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Triclosan	13391808	21509	40	20131211
Caelo	Triclosan	14121209	21591	40	20140718
Euro OTC	Triclosan	1406032-01	21615	40	20140710
Euro OTC	Triclosan	1507041	21856	40	20150804*
Euro OTC	Triclosan	1510045	22227	40	20150511*

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Triclosan	1602003	22373	30	20160204*
Euro OTC	Triclosan	1701032	22987	40	20170207*
Fagron	Triclosan	17K02-B06-343548	23915	40	20180105

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 310 spectra of 8 reference samples from the substance/substance group *Triclosan*. These samples are listed above in the section *calibration samples*. The reference samples originate from 8 different batches.

- 72 123 spectra from a total of 1574 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 486 spectra from 15 reference samples of the substance/substance group *Triclosan*.

- These include spectra of independent samples from 9 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Triclosan	83452249	20005	31
Caelo	Triclosan	13391808	21509†	20
Caelo	Triclosan	14121209	21591†	20
Euro OTC	Triclosan	1406032-01	21615†	20
Euro OTC	Triclosan	1507041	21856†	20
Euro OTC	Triclosan	1510045	22227†	20

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*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Triclosan	1602003	22373[†]	15
Caelo	Triclosan	160846	22453	60
Euro OTC	Triclosan	1607002	22674	40
Caelo	Triclosan	162808	22775	40
Caelo	Triclosan	171498	23315	40
Euro OTC	Triclosan	1705011	23425	40
Euro OTC	Triclosan	1708025	23699	40
Euro OTC	Triclosan	1801049	23964	40
Caelo	Triclosan	180814	24048	40

- 161 587 spectra from a total of 3484 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 1996 spectra from 370 *Apo-Ident* customers from 379 batches from the substance/substance group *Triclosan*.

- These include spectra of independent samples from 368 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Triclosan	12L06-N01	39
Fagron	Triclosan	434083	1
Fagron	Triclosan	4394083	2
Gehe	Triclosan	4394083	1
Fargon	Triclosan	4394403	1
Euro OTC	Triclosan	4486611	2
Anzag/	Triclosan	5846205	1
Fagron	Triclosan	5846205	2
BASF Chem trade GmbH/Ph…	Triclosan	5846205	1
BASF Grenzach/Noweda	Triclosan	5900346	1
Fagron	Triclosan	90000383	1
Fagron	Triclosan	9000383	2
BASF Grenzach GmbH/Phönix	Triclosan	10006226	1
Fagron	Triclosan	10006226	3
Fagron	Triclosan	10666066	2
Fagron	Triclosan	11777748	4
Fagron	Triclosan	106666066	1
Caelo	Triclosan	11777748	4
Euro OTC	Triclosan	12276023	1
Rondell Apotheke	Triclosan	11965460	1
Fagron	Triclosan	52/942	1
Caelo	Triclosan	3041408	1

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[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Supplier	Substance	Batch	Spectra
Fagron	Triclosan	6012014E	1
Caelo	Triclosan	808140I	1
Euro OTC	Triclosan	1006024-01	1
Fagron	Triclosan		3
Fagron	Triclosan	10112014C	1
Caelo	Triclosan	10290812	1
Fagron	Triclosan	10J18-N01	2
Gehe	Triclosan	11/19-N11	1
Caelo	Triclosan	11/28-N02	1
EuRho	Triclosan	1107030-01	2
Euro OTC	Triclosan	1107030-01	4
Caelo	Triclosan	11076715	1
Caelo	Triclosan	11076717	3
Caelo	Triclosan	11076716	1
Caelo	Triclosan	11238002	1
Caelo	Triclosan	11238003	2
Fagron	Triclosan	11238004	1
Caelo	Triclosan	11238004	1
Caelo	Triclosan	11238009	2
Caelo	Triclosan	11238011	3
Caelo	Triclosan	11238014	1
Caelo	Triclosan	1125204	1
Fagron	Triclosan	11A05-N13	1
Caelo	Triclosan	11D20-N10	2
Fagron	Triclosan	11D20-N10	3
Anzag am 24.05.2012	Triclosan	11d20-n10	1
Fagron	Triclosan	11H09-N02	10
Caelo	Triclosan	11d20-n10	1
Anzag	Triclosan	11H09-N02	1
Gehe	Triclosan	11J28-N02	1
Noweda	Triclosan	11J28-N02	1
Fagron	Triclosan	11J28-N02	8
Fagron	Triclosan	11L19-N11	6
Noweda	Triclosan	11L19-N11	1
Caelo	Triclosan	12003201	3
DAB 2008	Triclosan	12003201	2
Caelo	Triclosan	12003202	2
PHOENIX am 12.06.2012	Triclosan	12003202	1
Phoenix	Triclosan	12003202	1
Caelo	Triclosan	12003205	13
Caelo	Triclosan	12003210	7
EuRho	Triclosan	1202018-01	1
Phönix	Triclosan	1202018-01	2
Euro OTC	Triclosan	1202018-01	1
Euro OTC	Triclosan	1202018-02	2
Euro OTC	Triclosan	120203-02	1
Gehe	Triclosan	1206034-01	1
Phönix	Triclosan	1206034-01	1
Euro OTC	Triclosan	1206034-01	1
Euro OTC	Triclosan	1206034-02	3
Gehe	Triclosan	1206034-02	1
Fagron	Triclosan	1209213402	1
Euro OTC	Triclosan	1211025-01	12
Caelo	Triclosan	12145901	6
Caelo	Triclosan	1214510	1
anzag, 26.11.2012	Triclosan	12145902	1
Caelo	Triclosan	12145902	5
Caelo	Triclosan	12145906	7
Mühlen-Apotheke	Triclosan	12145906	1
Caelo	Triclosan	12145907	12

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Supplier	Substance	Batch	Spectra
Phönix	Triclosan	12145908	1
Caelo	Triclosan	12145908	8
Caelo	Triclosan	12145909	13
Caelo	Triclosan	12145910	13
Gehe	Triclosan	12145910	1
Caesar/Lorenz	Triclosan	12145910	1
Caelo	Triclosan	12145917	1
Fagron	Triclosan	1214I03402	1
Caelo	Triclosan	12359104	6
Caesar/Lorenz	Triclosan	12359104	1
Gehe	Triclosan	12359104	1
Caelo	Triclosan	12359105	11
Sanacorp	Triclosan	12359105	2
Gehe	Triclosan	12359105	1
Caelo	Triclosan	12359106	13
Sanacorp	Triclosan	12359106	1
Noweda	Triclosan	12359107	1
sana corp	Triclosan	12359106	1
Caelo	Triclosan	12359108	13
Caelo	Triclosan	12359107	1
Caelo	Triclosan	12359109	6
Phönix	Triclosan	12359109	1
Caelo	Triclosan	12359110	7
Caelo	Triclosan	12359111	11
Bombastus	Triclosan	12359111	1
Phönix, 02.08.2013	Triclosan	12359111	1
Phönix	Triclosan	12359111	1
Caelo	Triclosan	12359112	6
AHD, 02,12,13	Triclosan	12359112	1
anzag 20.11.2013	Triclosan	12359114	1
Gehe	Triclosan	12359112	1
Gehe	Triclosan	12359114	1
Caelo	Triclosan	12359114	1
Euro OTC	Triclosan	1245	1
Caelo	Triclosan	12c21-n05	1
Caelo	Triclosan	12680801	1
Fagron	Triclosan	12C21-n05	1
Gehe	Triclosan	12C21-N05	3
Fagron	Triclosan	12C21-N05	32
Fagron	Triclosan	12c21-n05	5
FARGON	Triclosan	12c21-n05	1
Fiebig ek: 9,54EUR 31.08.12	Triclosan	12C21-N05	1
Noweda	Triclosan	12C21-N05	1
Sino Phyto	Triclosan	12C21-N05	1
Caelo	Triclosan	12C21-N05	1
Fargon	Triclosan	12C21-N05	1
Fagron	Triclosan	12d02-n02	1
Fagron	Triclosan	12C21-N05	1
Fagron	Triclosan	12G09-N09	6
Anzag	Triclosan	12G09-N09	2
Alliance Healthcare	Triclosan	12G09-N09	1
Fagron	Triclosan	12G09-no9	1
Fagron	Triclosan	12G17-N04	33
Fagron	Triclosan	12G17-n04	1
Caelo	Triclosan	12G17-N04	2
Anzag 4.12.12 ek:8,89	Triclosan	12G17-N04	1
Fagron	Triclosan	12g17-n04	6
Großhandel	Triclosan	12G17-N04	1
Fargon	Triclosan	12G17-N04	1
Euro OTC	Triclosan	12G17-N04	1

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Supplier	Substance	Batch	Spectra
fargon	Triclosan	12G17-N04	1
Fagron	Triclosan	12G17N04	2
Anzag	Triclosan	12G17-N04	3
Kehr	Triclosan	12G17-N04	2
Krieger	Triclosan	12g17-N04	1
Noweda	Triclosan	12G17-N04	3
Gehe	Triclosan	12G17-N04	1
Fagron	Triclosan	12G17-No4	1
Fagron	Triclosan	12L06-0003	1
Bombastus	Triclosan	12L06-N01	2
Anzag 18.04.13 ek: 8.89EUR	Triclosan	12L06N01	1
Alliance Healthcare/Now…	Triclosan	12L06-N01	1
Caelo	Triclosan	12L06-N01	9
Gehe	Triclosan	12l06-n01	1
Alliance Healthcare	Triclosan	12L06-N01	1
Phönix	Triclosan	12L06-N01	2
GEHE	Triclosan	12L06-N01	1
Caelo	Triclosan	12l06-n01	1
Fagron	Triclosan	12l06-n01	1
Caelo	Triclosan	12L06-N01/0005900346	1
Fagron	Triclosan	12L06-NO1	1
Euro OTC	Triclosan	1303011-01	6
Fagron	Triclosan	13/10-N02	1
Euro OTC	Triclosan	130301101	1
Euro OTC	Triclosan	1307050-01	5
EuRho/Phönix	Triclosan	1307050-01	2
Fagron	Triclosan	13092012C	1
Caelo	Triclosan	13247805	1
Noweda	Triclosan	13247903	1
Caelo	Triclosan	13247903	1
Gehe	Triclosan	13247903	1
Caesar/Lorenz	Triclosan	13247904	1
Caelo	Triclosan	13247904	12
Sanacorp	Triclosan	13247904	2
Caesar&Loretz GmbH/Anzag	Triclosan	13247904	2
Caelo	Triclosan	13247905	10
phönix	Triclosan	13247905	1
Caeolo/Noweda	Triclosan	13247905	1
Caelo	Triclosan	13247908	2
Caelo	Triclosan	13391801	2
Caelo	Triclosan	13391802	5
Gehe	Triclosan	13391804	2
Caelo	Triclosan	13391804	9
GEHE 22.04.2014	Triclosan	13391804	1
Sanacorp	Triclosan	13391807	2
Caelo	Triclosan	13391807	7
Phönix Gotha	Triclosan	13391807	1
Caelo	Triclosan	13391808	9
Gehe	Triclosan	13391811	1
Fagron	Triclosan	13a11n03	1
Fagron	Triclosan	13A11-N03	11
Gehe	Triclosan	13A11-N03	1
Fagron	Triclosan	13A11N03	1
BASF Grenzach GmbH/Phönix	Triclosan	13A11-N03	1
Caelo	Triclosan	13A11-N03	2
Phönix	Triclosan	13A11-N03	1
Fagron	Triclosan	13A11-NO3	1
BASF Grenzach GmbH/Phönix	Triclosan	13A11-No3	1
Caelo	Triclosan	13D02-N02	7
Fagron	Triclosan	13D02-N02	90

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Supplier	Substance	Batch	Spectra
GEHE	Triclosan	13D02-N02	2
Gehe	Triclosan	13D02-N02	3
Fagron	Triclosan	13D02N02	1
Fargon	Triclosan	13D02-N02	2
Fischar/Gehe	Triclosan	13D02-N02	2
AHC 02.09.13 EK9,04	Triclosan	13D02-N02	1
Alliance Healthcare	Triclosan	13D02-N02	1
BASF Grenzach GmbH/Phönix	Triclosan	13D02-N02	1
Euro OTC	Triclosan	13D02-N02	1
Fagron	Triclosan	13d02-N02	1
Fagron	Triclosan	13D02-N-02	1
Fragron	Triclosan	13D02-N02	1
Caelo	Triclosan	13D02-No2	1
Sanacorp	Triclosan	13D02-No2	1
Fagron	Triclosan	13D02-NOZ	1
Europ Ots Pharma	Triclosan	13DO2-NO2	1
Fagron	Triclosan	13Do2-N02	1
Fagron	Triclosan	13Do2-No2	2
Fagron	Triclosan	13DO2-N02	1
Fagron	Triclosan	13DO2-NO2	1
Fagron	Triclosan	13H08-N10	30
Fagron	Triclosan	13H08N10	2
Caelo	Triclosan	13H08-N10	2
Sanacorp	Triclosan	13H08-N10	1
Fagro/Gehe	Triclosan	13H08-N10	1
Fagron	Triclosan	13H08-N-10	1
Euro OTC	Triclosan	13H08-N10	1
Fagron	Triclosan	13H08-N100450/1231	1
Fagron	Triclosan	13H09-N01	80
Caelo	Triclosan	13H09-N01	10
BASF Grenzach GmbH/Phönix	Triclosan	13H09-N01	1
Alliance Healthcare/Fis...	Triclosan	13H09-N01	1
Phönix	Triclosan	13H09-N01	1
Fagron	Triclosan	13H09N01	2
Fagron	Triclosan	13H09-No1	2
Fagron	Triclosan	13H09-N011296/2856	1
Fagron	Triclosan	13H09-NO1	1
Fagron	Triclosan	13J10-N02	1
Bombastus	Triclosan	13L18-35-289984	1
Fagron	Triclosan	13L18-35-289995	1
Fagron	Triclosan	13L18-B35	14
Phonix	Triclosan	13L18-B35	1
Alliance Healthcare	Triclosan	13L-18-835	1
Fagron	Triclosan	13L18-B35289995	1
Fagron	Triclosan	13L18-B35-289	1
Fagron	Triclosan	13L18-B35-289983	10
Fagron	Triclosan	13L18-B35-289984	5
Caelo	Triclosan	13L18-B35-289984	1
Raben-Apotheke Mildenau	Triclosan	13L18-B35-289984	2
Fagron	Triclosan	13L18B35289984	1
Fagron	Triclosan	13L18-B35-289985	14
noweda	Triclosan	13L18-B35-289985	1
Fagron	Triclosan	13L-18-B35-289985	1
Phönix	Triclosan	13L18-B35-289985	1
Caelo	Triclosan	13L18-B35-289985	1
Fagron	Triclosan	13L18-B35-289986	8
Caelo	Triclosan	13L18-B35-289986	2
Caelo	Triclosan	13L18B35289986	1
Fagron	Triclosan	13L18B35289987	1
Fagron	Triclosan	13L18-B35-289987	8

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Supplier	Substance	Batch	Spectra
sanacorp	Triclosan	13L18-B35-289987	1
Gehe	Triclosan	13L18-B35-289987	1
Caelo	Triclosan	13L18-B35-289987	1
Fagron	Triclosan	13L18-B35-289988	2
Caelo	Triclosan	13L18-B35-289992	4
Fagron	Triclosan	13L18-B35-289992	2
AHD 17.01.15	Triclosan	13L18-B35-289992	1
Caelo	Triclosan	13L18B35289993	1
Fagron	Triclosan	13L18-B35-289993	4
Euro OTC	Triclosan	13L18-B35-289993	1
Fagron	Triclosan	13L18B35-289993	1
Fagron	Triclosan	13L18-B35-289994	6
Caelo	Triclosan	13L18-B35-289995	1
Fagron	Triclosan	13L18-B35-289995	11
Phönix	Triclosan	13L18-B35-289995	2
Alliance Health 26.11.2...	Triclosan	13L18-B35-289995	1
Sonnenberg-Apotheke	Triclosan	13L18-B35-289995	1
Anzag	Triclosan	13L18-B35-289995	1
Phönix	Triclosan	13L8-B35	1
Euro OTC	Triclosan	1401038-01	10
EuRho / 30	Triclosan	1401038-01	1
Euro OTC	Triclosan	140103801	1
Fagron	Triclosan	14022014C	1
EuRho/Phoenix	Triclosan	1401038-01	1
Fagron	Triclosan	1403217068	1
Caelo	Triclosan	14052101	7
Caelo	Triclosan	14052102	12
GEHE 17.06.2014	Triclosan	14052102	1
Caelo	Triclosan	14052103	18
Sanacorp	Triclosan	14052103	1
Caelo	Triclosan	14052105	1
Gehe	Triclosan	14052105	1
Euro OTC	Triclosan	1406032-01	10
Gehe	Triclosan	1406032-01	1
Apomix/Noweda	Triclosan	1406032-01	2
Euro OTC	Triclosan	140603201	1
Euro OTC	Triclosan	1408024-01	6
EuRho	Triclosan	1408024-01	1
Gehe	Triclosan	1408024-01	1
Phönix Gotha	Triclosan	1408024-01	2
Caelo	Triclosan	1412109	1
Noweda	Triclosan	1408024-01	1
Caelo	Triclosan	14121203	8
Caelo	Triclosan	14121204	7
Euro OTC	Triclosan	14121204	1
Caelo	Triclosan	14121207	13
Phoenix 19.11.14	Triclosan	14121207	1
ebe a	Triclosan	14121207	1
Caelo	Triclosan	14121209	9
Sana 06.11.14 EK 3,38	Triclosan	14121209	1
Sana 05.12,14 3,38	Triclosan	14121210	2
Caelo	Triclosan	14121210	10
Caelo	Triclosan	14121211	9
Sanacorp	Triclosan	14121211	1
Caelo	Triclosan	14121214	10
Caelo	Triclosan	14121215	18
Caesar&Loretz GmbH/Anzag	Triclosan	14121215	2
Sanacorp	Triclosan	14121215	1
Caelo	Triclosan	14121220	1
Caelo	Triclosan	14205901	6

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Supplier	Substance	Batch	Spectra
Caelo	Triclosan	14205902	10
Caelo	Triclosan	14205903	10
Phoenix	Triclosan	14205903	1
Caelo	Triclosan	14205904	6
Caelo	Triclosan	14205905	4
Caelo	Triclosan	14211207	1
Caelo	Triclosan	14211211	1
Caelo	Triclosan	1425903	1
Fagron	Triclosan	14F23-B02	9
Caelo	Triclosan	14F23-B02	1
Fagron	Triclosan	14F23-B02295756	1
Caelo	Triclosan	14f23-b02-29385	1
Fagron	Triclosan	14F23-B02-293852	2
Fagron	Triclosan	14F23-B02-295756	3
Caelo	Triclosan	14F23B02293859	1
Fagron	Triclosan	14F23-B02-295757	5
Fagron	Triclosan	14F23-B02295757	1
Fagron	Triclosan	14f23-b02-295757	1
Fagron	Triclosan	14F23-B02-295758	9
Fagron	Triclosan	14f23-b02-295758	1
Fagron	Triclosan	14F23B02295758	1
Caelo	Triclosan	14F23-B02-295759	1
Fagron	Triclosan	14F23-B02-295759	10
Fagron	Triclosan	14F23-B02-295760	10
Allianc.Healthc../Apomix	Triclosan	14F23-B02-295760	1
Fagron	Triclosan	14F23-B02-295761	11
Fagron	Triclosan	14F23-B02-295762	2
Fagron	Triclosan	14F23-B02-295763	1
Caelo	Triclosan	14F23-B02-295765	1
Fagron	Triclosan	14F23-B02-295764	2
Fagron	Triclosan	14F23B02295763	1
Noweda	Triclosan	14F23-B02-295765	1
Fagron	Triclosan	14F23-B02-295765	6
Fagron	Triclosan	14F23-B02-295947	7
Fagron	Triclosan	14F23-B02-295948	6
Cealo/AHD	Triclosan	14F23-B02-295947	1
Fagron	Triclosan	14F23-B02-2959947	1
Fagron	Triclosan	14F23B02300219	1
Fagron	Triclosan	14F23-B02-300219	7
Gehe-Fragon	Triclosan	14F23B02300219	2
Faron	Triclosan	14F23-B02-300219	2
Phönix	Triclosan	14F23-Bo2-29575	1
Fagron	Triclosan	14F23-Bo2-295947	1
Fagron	Triclosan	14F-B02-293859	1
Kremer/Phönix	Triclosan	15/157/T	1
Euro OTC	Triclosan	1501032-01	11
Caelo	Triclosan	150103201	1
Euro OTC	Triclosan	1501032-02	4
Caelo	Triclosan	1501032-02	1
Euro OCT/Noweda	Triclosan	1501032-02	1
Caelo	Triclosan	1505009	1
Euro OTC	Triclosan	1505009-01	10
Euro OTC	Triclosan	150500901	1
Sanacorp	Triclosan	1505009-01	1
Fagron	Triclosan	1505009-01	1
Euro OTC	Triclosan	1507041-01	6
Caelo	Triclosan	1507041-01	2
Caelo	Triclosan	150704101	1
Euro OTC	Triclosan	1510045-01	12
EuRho	Triclosan	151004501	1

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Supplier	Substance	Batch	Spectra
Euro UTC	Triclosan	1510045-01	1
Euro OTC	Triclosan	151004501	1
Sanacorp	Triclosan	151004501	1
Fagron	Triclosan	151010-B06-312984	1
Noweda	Triclosan	15203603	2
Caelo	Triclosan	15203603	14
Caelo	Triclosan	15121202	1
Caesar&Loretz GmbH/Anzag	Triclosan	15203603	2
Caelo	Triclosan	15203604	11
Fagron	Triclosan	15203604	1
Noweda	Triclosan	15203604	1
Caelo	Triclosan	15203606	10
Caesar&loretz,Phönix	Triclosan	15203606	1
Caelo	Triclosan	15203607	10
caesar&loretz,Phönix	Triclosan	15203607	1
Euro OTC	Triclosan	15203607	3
Caelo	Triclosan	15203608	5
Caesar & Loretz GmbH Hi...	Triclosan	15203607	1
Caelo	Triclosan	1520603	1
Caelo	Triclosan	15301501	2
Caelo	Triclosan	15301502	9
Caesar und Loretz	Triclosan	15301502	1
Caelo	Triclosan	15301503	7
Caesar u Loretz	Triclosan	15301503	1
Caelo	Triclosan	15301504	10
Caesar & Loretz GmbH Hi...	Triclosan	15301504	2
Caelo	Triclosan	15301505	10
Caesar&Loretz GmbH/Sana...	Triclosan	15301505	1
Caelo	Triclosan	15301506	9
Caelo	Triclosan	15301510	4
Fagron	Triclosan	15301510	1
Caelo	Triclosan	15301511	4
Caelo	Triclosan	15301512	4
Caelo	Triclosan	15301513	2
Caelo	Triclosan	15301514	3
Fagron	Triclosan	15C10-B06	6
Phoenix	Triclosan	15C10-B06	1
Kumar Organic/Noweda	Triclosan	15C10-B06	1
Fagron	Triclosan	15C10-B06-310031	4
Fagron	Triclosan	15C10-B06312980	1
Fagron	Triclosan	15C10B06310031	1
Fagron	Triclosan	15C10-B06-310032	4
triclosan	Triclosan	15C10-B06-310032	1
Fagron	Triclosan	15C10-B06-311161	13
Fagron	Triclosan	15C10B06311161	2
Fagron	Triclosan	15c10-B06-311161	1
Caelo	Triclosan	15C10-B06-311161	1
Fagron	Triclosan	15C10-B06-312980	2
Fagron	Triclosan	15C10-B06-312981	13
Gehe/Fragon	Triclosan	15C10B06312981	2
Euro OTC	Triclosan	15C10-B06-312981	1
Fagron	Triclosan	15C10-B06-312982	16
Caelo	Triclosan	15C10-B06-312982	3
Fagron	Triclosan	15C10B06312982	1
Fagron	Triclosan	15C10-B06-312983	6
Fagron	Triclosan	15C10B06312983	1
Fagron	Triclosan	15C10-Bo6-311161	1
Fagron	Triclosan	15C-B06-312982	1
Fagron	Triclosan	15G01-B03-310038	1
Fagron	Triclosan	15G07-B03	3

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Supplier	Substance	Batch	Spectra
Fagron	Triclosan	15G07-B03-310038	8
Caelo	Triclosan	15G07-B03-30039	1
Fagron	Triclosan	15G07-B03-310035	6
Fagron	Triclosan	15G07-B03-310036	3
Gehe-Fragon	Triclosan	15G07B03310036	2
Caelo	Triclosan	15G07-B03-310037	2
Fagron	Triclosan	15G07-B03-310037	10
Fagron	Triclosan	15G07B03310037	1
Fagron	Triclosan	15g07-b03-310037	1
Hageda/Fargon	Triclosan	15G07-B03-310038	1
Caelo	Triclosan	15G07-B03-310038	1
Fagron	Triclosan	15G07-B03-310040	6
Fagron	Triclosan	15G07-B03-310039	1
Euro OTC	Triclosan	15G07-B03-310040	1
Fragron	Triclosan	15G07-B03-310040	1
Fagron	Triclosan	15G07B03310040	1
Euro OTC	Triclosan	1602003-01	20
Caelo	Triclosan	160084601	1
Euro OTC	Triclosan	160200301	1
Caelo	Triclosan	1602003-01	2
EuRhoNoweda	Triclosan	1602003-01	1
Euro OTC	Triclosan	160203-01	1
Euro OTC	Triclosan	1607002-01	22
Caelo	Triclosan	16021306	1
Caelo	Triclosan	1607002-01	1
Euro OTC	Triclosan	160702-01	1
Caelo	Triclosan	16084601	6
Caelo	Triclosan	160846018	1
Caelo	Triclosan	16084602	5
Caelo	Triclosan	16084603	3
Caesar & Loretz/AHC	Triclosan	16084603	2
Fagron	Triclosan	16084603	1
Caelo	Triclosan	16084604	1
Caelo	Triclosan	16084606	3
Caelo	Triclosan	16084607	4
Sanacorp	Triclosan	16084607	1
Caelo	Triclosan	16084608	10
Caelo	Triclosan	16084609	2
Caesar&Loretz GmbH	Triclosan	16084609	1
Caelo	Triclosan	16084610	6
Caelo	Triclosan	16084611	8
Phoenix	Triclosan	16084614	1
Caelo	Triclosan	16084614	11
Fagron	Triclosan	16084614	1
Euro OTC	Triclosan	16084614	1
Caelo	Triclosan	16084618	5
Caelo	Triclosan	16084615	1
Caesar&Loretz,AHC,12.12...	Triclosan	16084618	1
Euro OTC	Triclosan	1609005-01	10
Euro OTC	Triclosan	1609005-02	5
Caelo	Triclosan	16280801	13
Gehe	Triclosan	16280801	2
Phönix	Triclosan	16280801	1
Caelo	Triclosan	16280802	6
Caelo	Triclosan	16280803	2
Caelo	Triclosan	16280805	2
Caelo	Triclosan	16280808	4
Caelo	Triclosan	16280809	3
Gehe	Triclosan	16280808	1
Caelo	Triclosan	16280810	1

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Supplier	Substance	Batch	Spectra
Caelo	Triclosan	16280811	10
hochhaus-Apotheke	Triclosan	16280811	1
Caesar & Loretz GmbH	Triclosan	16280811	1
Phönix	Triclosan	16280811	2
Caelo	Triclosan	16280816	7
Caelo	Triclosan	16280817	3
Apotheke an der Bornhei…	Triclosan	16280817	2
Caelo	Triclosan	16280818	2
Caelo	Triclosan	16280819	1
Caelo	Triclosan	1628082	1
Caelo	Triclosan	16280820	2
Caelo	Triclosan	16280821	1
Caelo	Triclosan	16280824	1
Euro OTC	Triclosan	169005-02	1
Euro/Phönix	Triclosan	170103201	1
Phoenix	Triclosan	1701032-01	1
Euro OTC	Triclosan	1701032-01	5
Gehe	Triclosan	1701032-01	1
Euro OTC	Triclosan	1701032-02	1
Phoenix	Triclosan	1701032-02	1
Euro OTC	Triclosan	1705011-01	7
Gehe	Triclosan	1705011-01	1
Euro OTC	Triclosan	170501101	1
Fagron	Triclosan	1708025-01	1
Caelo	Triclosan	17081703	2
Caelo	Triclosan	17081707	11
Caelo	Triclosan	17081704	1
Caelo	Triclosan	17081705	3
phoenix	Triclosan	17081707	2
Caelo	Triclosan	17081709	2
Caelo	Triclosan	17081710	3
Caleo/Phönix	Triclosan	17081711	1
Caelo	Triclosan	17081711	1
Caelo	Triclosan	17081712	4
phönix	Triclosan	17081712	1
Caelo	Triclosan	17081713	4
Caelo	Triclosan	17081716	2
Caelo	Triclosan	17081720	1
Caelo	Triclosan	17081721	1
Caelo	Triclosan	17081725	6
Caelo	Triclosan	17081724	2
Phönix	Triclosan	17081725	1
Caelo	Triclosan	17149805	2
Caelo	Triclosan	17149817	1
Fagron	Triclosan	17G07-B03-310038	1
Fagron	Triclosan	17K02-B06	1
Euro OTC	Triclosan	1801049-01	1
Fagron	Triclosan	18082014B	1
Fagron	Triclosan	190615A	1
Caelo	Triclosan	20021304	1
Fagron	Triclosan	200315B	1
Caelo	Triclosan	2213M-03402	1
Caelo	Triclosan	23121409	1
Fagron	Triclosan	2513Q-03402	1
Sanacorp	Triclosan	26/AKD1	1
Caelo	Triclosan	2613Q-03402	1
Sanacorp	Triclosan	28/AKD4	1
Fagron	Triclosan	2914E-03402	1
Fagron	Triclosan	2901313402	1
Caelo	Triclosan	31/AKD7	1

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Supplier	Substance	Batch	Spectra
Caelo	Triclosan	32/AKD13	1
Caelo	Triclosan	32/AKD11	1
Caelo	Triclosan	33/AKD1	1
Caelo	Triclosan	5012E-03402	1
Caelo	Triclosan	4212E-03402	1
Fagron	Triclosan	3954/V04/17	1
Caelo	Triclosan	5203607	1
Euro OTC	Triclosan	700228	1
Fagron	Triclosan	700228-0005	1
Fagron	Triclosan	C12H7Cl302	1
Fagron	Triclosan	B03-310037	1
Caelo	Triclosan	AKD12	1
Caelo	Triclosan		4
Sanacorp	Triclosan		2
Phoenix	Triclosan		1
Euro OTC	Triclosan	CHB1303011-01	1
Fagron	Triclosan	TCS0214037	1
Fagro/Sanacorp	Triclosan	TCS0214037	1
Gutenberg-Apotheke	Triclosan	13H09-N01	2
Gutenberg-Apotheke	Triclosan	13L18-B35	1
Beiersdorf	Triclosan	14F23-B02-295764	1
Fargon	Triclosan	14F23-B02-295948	1
Caeo/Noweda	Triclosan	15301505	1
Fagron	Triclosan	15C10-B06-3161	1
Caelo	Triclosan	P144/14	1
Anzag	Triclosan	5846205	1
Gehe	Triclosan	11/28-N02	1
Herbasinica	Triclosan	11d20-n10	1
Gehe	Triclosan	11D20-N10	1
Gehe	Triclosan	11H09-N02	1
Fagron	Triclosan	12G09N09	1
A.H.D.	Triclosan	12L06-N01	1
agron/ Noweda	Triclosan	13A11-N03	1
Eigenproduktion	Triclosan	13A11-N03	1
Sanacorp	Triclosan	13D02-N02	1
Fagron	Triclosan	13h08-n10	1
Caelo	Triclosan	13H09-No1	1

- 75 163 spectra from 463 *Apo-Ident* customers from a total of 25 173 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Triclosan* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Triclosan* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	310	0	72 123
Type B	0	486	0	161 587
Type C	0	1955	41	75 163

The substance/substance group *Triclosan* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9887 %)	100.0000 % (> 98.0645 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 98.7654 %)
Type C	100.0000 % (> 99.8849 %)	97.9459 % (> 97.7956 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21509	22373	2.56	61.53
21591	22373	3.57	61.64
21615	22373	2.42	62.43
21856	21856	0.00	60.97
22227	22227	0.00	59.93
22373	22373	0.00	61.21
22987	22987	0.00	59.66
23915	22987	6.36	62.08

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Trometamol**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20004-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Trometamol; Trometamolum

Special notes

When selecting the *Trometamol* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Trometamol*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Trometamol	13E22-N05	20856	40	AR-17-FG-016395-01
Caelo	Trometamol	14050002	21358	40	20140220
Caelo	Trometamol	161688	22629	40	20160615*
Caelo	Trometamol	16168810	23498	40	20160615

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 4 reference samples from the substance/substance group *Trometamol*. These samples are listed above in the section *calibration samples*. The reference samples originate from 4 different batches.

- 72 273 spectra from a total of 1578 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 190 spectra from 5 reference samples of the substance/substance group *Trometamol*.

- These include spectra of independent samples from 4 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Trometamol	83303189	20004	30
Fagron	Trometamol	17A16-B04-334121	23516	40
Fagron	Trometamol	17A16-B04-334121	23517	40
Caelo	Trometamol	173208	23787	40
Euro OTC	Trometamol	1803016	24063	40

- 161 883 spectra from a total of 3495 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B*

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 418 spectra from 207 *Apo-Ident* customers from 109 batches from the substance/substance group *Trometamol*.

- These include spectra of independent samples from 103 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Trometamol	213E-02519	1
Caelo	Trometamol	313I-02519	1
Caelo	Trometamol	314Q2519	1
Caelo	Trometamol	215I-02519	1
Fagron	Trometamol	610I-02519	1
Caelo	Trometamol	8031301	1
Caelo	Trometamol	914I-02519	1
Caelo	Trometamol	1001312519	1
Caelo	Trometamol		5
Gehe	Trometamol	11025103	1
Caelo	Trometamol	11160706	1
Caesar & Loretz	Trometamol	11160707	1
Caelo	Trometamol	11160707	2
Caelo	Trometamol	11160711	1
Gehe	Trometamol	11160708	1
Caesar & Loretz GmbH, 4...	Trometamol	11160714	1
Caelo	Trometamol	11160714	4
GEHE	Trometamol	11376005	1
Caelo	Trometamol	11376005	6
Noweda	Trometamol	11376005	1
Caelo	Trometamol	11376006	10
Fagron	Trometamol	11H08-N05	1
Apotheke in Steinkuhl	Trometamol	120104/11	1
Euro OTC	Trometamol	1203005-02	2
Noweda	Trometamol	12113502	1
Caelo	Trometamol	12113502	5
Caelo	Trometamol	12113505	1
Großhandel	Trometamol	12113506	1
Sanacorp	Trometamol	12113506	1
Caelo	Trometamol	12113506	10
Caelo	Trometamol	12113508	1
Caelo	Trometamol	12113511	1
Caelo	Trometamol	12113510	1
Caelo	Trometamol	12113512	10
Anzag	Trometamol	12113512	1
ANZAG	Trometamol	12113512	1
Phönix	Trometamol	12113512	1
Caelo	Trometamol	12113515	5
Fagron	Trometamol	12E25-B40	1
Fagron	Trometamol	12I27-N03	2
Fagron	Trometamol	12I27-N03	1
Fagron	Trometamol	12I27-No3	2
Fagron	Trometamol	12k14n05	1
Fagron	Trometamol	12K14-N05	2

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Supplier	Substance	Batch	Spectra
Caelo	Trometamol	12K14-N05	1
Fagron	Trometamol	12k14no5	1
Fagron	Trometamol	13/19-B02	1
Fagron	Trometamol	13/19-B02-286158	3
Phönix Gotha	Trometamol	13/19-B02-286158	1
Fagron	Trometamol	13/19-B02-293595	2
Caelo	Trometamol	13051401	1
Caelo	Trometamol	13095901	10
Gehe	Trometamol	13095901	1
Phönix 1. 07. 2013	Trometamol	13095901	1
Caelo	Trometamol	13095902	13
Phönix, 02.08.2013	Trometamol	13095902	1
Klenk	Trometamol	13095902	3
Caesar & Loretz GmbH, 4...	Trometamol	13095902	1
Caelo	Trometamol	13095905	1
Caelo	Trometamol	13095910	5
Caelo	Trometamol	13095911	16
Anzag	Trometamol	13095911	1
Caelo	Trometamol	13095912	18
Phönix	Trometamol	13095912	2
Sanacorp	Trometamol	13095912	1
Caelo	Trometamol	13095913	3
Caelo	Trometamol	13095915	3
Fagron	Trometamol	13119-B02	1
Phönix Gotha	Trometamol	1319-B02-286158	1
Caelo	Trometamol	13339103	8
Fagron	Trometamol	13339103	1
Caelo	Trometamol	13339105	1
Caelo	Trometamol	13339107	7
Caelo	Trometamol	13339108	13
Caelo	Trometamol	1339103	1
Fagron	Trometamol	13C08-N07	3
Caelo	Trometamol	13C-08-N07	1
Fagron	Trometamol	13E22-N05	6
Caelo	Trometamol	13E22-N05	1
Gehe	Trometamol	13E22-N05	1
Fagron	Trometamol	13I19-B02	1
Fagron	Trometamol	13l19-B02-286158	1
Fagron	Trometamol	13I19-B02-286158	1
Caelo	Trometamol	14050002	8
Caelo	Trometamol	14050003	3
Caelo	Trometamol	14050004	4
Caesar & Loretz GmbH	Trometamol	14050003	1
Caelo	Trometamol	14050006	1
Caelo	Trometamol	14332402	18
Phönix	Trometamol	14332402	1
Caelo	Trometamol	14332403	1
Caelo	Trometamol	14332404	1
Caelo	Trometamol	14332409	1
Fagron	Trometamol	14F19-B03	1
Fagron	Trometamol	14F19-B03-304293	2
Caelo	Trometamol	15070304	13
Caelo	Trometamol	15070307	6
Caelo	Trometamol	15070308	18
sanacoro	Trometamol	15070308	1
Caelo	Trometamol	15070309	1
Caelo	Trometamol	15070311	16
Caelo	Trometamol	15094401	16
Caelo	Trometamol	15094404	1
Caelo	Trometamol	15377602	13

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Supplier	Substance	Batch	Spectra
Caelo	Trometamol	15277602	1
Sanacorp	Trometamol	15377602	1
Caelo	Trometamol	15377604	1
Caelo	Trometamol	15377605	1
Caelo	Trometamol	15377607	8
Caelo	Trometamol	15377611	8
Gehe	Trometamol	15377611	1
Caelo	Trometamol	16168801	1
Caelo	Trometamol	16168807	1
Caelo	Trometamol	16168810	7
Caelo	Trometamol	16168812	1
Caelo	Trometamol	16168816	2
Caelo	Trometamol	16168819	2
Caelo	Trometamol	16168820	2
Caelo	Trometamol	18081503	1
Caelo	Trometamol	21082013A	1
Caelo	Trometamol	26111201	1
Caelo	Trometamol	23062015B	1
Caelo	Trometamol	27111304	1
Fagron	Trometamol	286158	1
Caelo	Trometamol	3713E-02519	1
Fagron	Trometamol	294101	1
Sanacorp	Trometamol	3686G018	1
Caelo	Trometamol	5012M-02519	1
Caelo	Trometamol	5315I-02519	1
Fagron	Trometamol	8386E050	1
Merck	Trometamol	8386F017	1
Fagron	Trometamol	C4H11NO3	1
Sanacorp	Trometamol	8386F030	1
Sanacorp	Trometamol		1
Caelo	Trometamol	12113507	3
AHD	Trometamol	13095910	1

- 76 741 spectra from 463 *Apo-Ident* customers from a total of 25 440 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Trometamol* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Trometamol* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	160	0	72 273
Type B	0	190	0	161 883
Type C	0	414	4	76 741

The substance/substance group *Trometamol* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 96.8421 %)
Type C	100.0000 % (> 99.8849 %)	99.0431 % (> 98.3254 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20856	20856	0.00	31.36
21358	22629	5.84	28.69
22629	22629	0.00	29.17
23498	22629	5.44	29.48

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Tropicamide**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20598-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Tropicamide; Tropicamidum

Special notes

When selecting the *Tropicamide* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Tropicamide*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Tropicamide	14D23-B04-293294	21685	40	AR-15-FG-001641-01
Fagron	Tropicamide	16G19-B05-324829	22885	40	20160905

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 80 spectra of 2 reference samples from the substance/substance group *Tropicamide*. These samples are listed above in the section *calibration samples*. The reference samples originate from 2 different batches.

- 72 353 spectra from a total of 1580 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 260 spectra from 7 reference samples of the substance/substance group *Tropicamide*.

- These include spectra of independent samples from 5 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
zu erfassen	Tropicamide	`zu erfassen`	20514	40
Fagron	Tropicamide	`12C26-N02`	20598	40
Fagron	Tropicamide	`12C26-N02`	20626	40
Fagron	Tropicamide	`14D23-B04-293294`	21685†	20
Fagron	Tropicamide	`17D25-B07-336833`	23506	40
Fagron	Tropicamide	`17J06-B04-341322`	23982	40
Audor Pharma	Tropicamide	`APFP/TD003/09/17/TR`	23983	40

- 161 813 spectra from a total of 3494 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 22 spectra from 8 *Apo-Ident* customers from 17 batches from the substance/substance group *Tropicamide*.

- These include spectra of independent samples from 17 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Tropicamide	12B01-N02	1
Fagron	Tropicamide	12C26-N02	1
Fagron	Tropicamide	12F18-N06	4
Fagron	Tropicamide	13A30-N06	1
Fagron	Tropicamide	12l04-n03	1
Fagron	Tropicamide	13L31-B08-289830	1
Fagron	Tropicamide	14D23-B04	1
Fagron	Tropicamide	14D23B04293294	1
Fagron	Tropicamide	13L-31-B08-292075	1
Phoenix	Tropicamide	14L04-B02	2
Fagron	Tropicamide	14l04-b02-315694	1
Gehe	Tropicamide	15F-18B-04	1
Gehe	Tropicamide	15F18-B04	1
Fagron	Tropicamide	20021302	1
Fagron	Tropicamide	23071508	1
Fagron	Tropicamide	Ch12L04-N03	2
Fagron	Tropicamide	Ch13L31-B08-289830	1

- 77 137 spectra from 463 *Apo-Ident* customers from a total of 25 530 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Tropicamide* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Tropicamide* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	80	0	72 353
Type B	0	260	0	161 813
Type C	0	22	0	77 137

The substance/substance group *Tropicamide* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 97.6923 %)
Type C	100.0000 % (> 99.8850 %)	100.0000 % (> 72.7273 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21685	21685	0.00	41.99
22885	21685	24.85	40.61

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Tyrosine**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	`21574-2018-07-18`
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Tyrosine; Tyrosinum

Special notes

When selecting the *Tyrosine* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Tyrosine*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Tyrosine	`13G24-N22`	`21574`	40	`1411030`
Euro OTC	Tyrosine	`L1401037-01`	`21586`	40	`20140217`

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 80 spectra of 2 reference samples from the substance/substance group *Tyrosine*. These samples are listed above in the section *calibration samples*. The reference samples originate from 2 different batches.

- 72 353 spectra from a total of 1580 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 120 spectra from 4 reference samples of the substance/substance group *Tyrosine*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Tyrosine	13G24-N22	21574†	20
Euro OTC	Tyrosine	L1401037-01	21586†	20
Fagron	Tyrosine	16B26-B01-322911	23533	40
Fagron	Tyrosine	17B06-B03-338139	24008	40

- 161 953 spectra from a total of 3495 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 4 spectra from 3 *Apo-Ident* customers from 4 batches from the substance/substance group *Tyrosine*.

- These include spectra of independent samples from 4 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Tyrosine	12H09-N09	1
Euro OTC	Tyrosine	L1210050-01	1
Euro OTC	Tyrosine	L1401037	1
Dr. Behr	Tyrosine	WE14080018	1

- 77 155 spectra from 463 *Apo-Ident* customers from a total of 25 543 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Tyrosine* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Tyrosine* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	80	0	72 353
Type B	0	120	0	161 953
Type C	0	4	0	77 155

The substance/substance group *Tyrosine* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 95.0000 %)
Type C	100.0000 % (> 99.8853 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21574	21574	0.00	89.76
21586	21574	11.56	85.50

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Tyrothricin**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20732-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Tyrothricin; Tyrothricinum

Special notes

When selecting the *Tyrothricin* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Tyrothricin*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Tyrothricin	12K14-N01	20732	40	1509178
Fagron	Tyrothricin	12K14-N01	21683	40	AR-15-FG-001172-01
Fagron	Tyrothricin	14A23-B05-294146	21876	40	AR-15-FG-015005-01

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Tyrothricin*. These samples are listed above in the section *calibration samples*. The reference samples originate from 2 different batches.

- 72 313 spectra from a total of 1580 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 186 spectra from 5 reference samples of the substance/substance group *Tyrothricin*.

- These include spectra of independent samples from 1 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Tyrothricin	12K14-N01	21683†	20
Fagron	Tyrothricin	14A23-B05-294146	21876†	20
Fagron	Tyrothricin	17E09-B03-341231	23742	40
Fagron	Tyrothricin	12K14-N01	21683SI	60
Fagron	Tyrothricin	14A23-B05-294146	21876SI	46

- 161 887 spectra from a total of 3496 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 1 spectra from 1 *Apo-Ident* customers from 1 batches from the substance/substance group *Tyrothricin*.

- These include spectra of independent samples from 1 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Tyrothricin	13A14-NO4	1

- 77 158 spectra from 463 *Apo-Ident* customers from a total of 25 546 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Tyrothricin* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Tyrothricin* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	168	18	161 887
Type C	0	1	0	77 158

The substance/substance group *Tyrothricin* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	90.3226 % (> 88.7097 %)
Type C	100.0000 % (> 99.8862 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20732	20732	0.00	37.43
21683	21683	0.00	36.98
21876	21876	0.00	39.45

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Ubidecarenone**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20392-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Ubidecarenone; Ubidecarenonum

Special notes

When selecting the *Ubidecarenone* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Ubidecarenone*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Ubidecarenone	1205029-01	21247	40	20121009
Caelo	Ubidecarenone	14004504	21388	40	AR-15-FG-009220-01
Euro OTC	Ubidecarenone	1605030	22696	40	20160623*
Euro OTC	Ubidecarenone	1703026	23127	40	20170406*
Caelo	Ubidecarenone	17209402	23581	40	20170823
Euro OTC	Ubidecarenone	1801019	23881	40	20180126*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 240 spectra of 6 reference samples from the substance/substance group *Ubidecarenone*. These samples are listed above in the section *calibration samples*. The reference samples originate from 6 different batches.

- 72 193 spectra from a total of 1576 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 260 spectra from 7 reference samples of the substance/substance group *Ubidecarenone*.

- These include spectra of independent samples from 5 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Ubidecarenone	10H19-N10	20360	40
Dr. Behr	Ubidecarenone	WE-11100005	20392	40
Caelo	Ubidecarenone	14004504	21388†	20
Fagron	Ubidecarenone	16G26-B01-331742	23161	40
Caelo	Ubidecarenone	17209402	23580	40
Caelo	Ubidecarenone	172094	23647	40
Euro OTC	Ubidecarenone	1802025	24074	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 813 spectra from a total of 3492 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 15 spectra from 7 *Apo-Ident* customers from 15 batches from the substance/substance group *Ubidecarenone*.

- These include spectra of independent samples from 14 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Ubidecarenone	14H26-B04-298244	1
Euro OTC	Ubidecarenone	1515M-07029	1
Fagron	Ubidecarenone	16B10-B05	1
Fagron	Ubidecarenone	16G26-B01	1
Audor Pharma	Ubidecarenone	APSCFQ150614C	1
Audor Pharma	Ubidecarenone	APSZFQ150614C	1
Fagron	Ubidecarenone	10H19-N-10	1
Cfm Oskar Tropitzsch	Ubidecarenone	5300001	1
Fagron	Ubidecarenone	14E12-B06-293861	1
Euro OTC	Ubidecarenone	1014E-07029	1
Euro OTC	Ubidecarenone	1403020-02	1
Euro OTC	Ubidecarenone	L1403020-01	1
Euro OTC	Ubidecarenone	L1412004-01	1
Euro OTC	Ubidecarenone	1104003-01	1
Euro OTC	Ubidecarenone	1205029-01	1

- 77 144 spectra from 463 *Apo-Ident* customers from a total of 25 532 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Ubidecarenone* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ubidecarenone* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	240	0	72 193
Type B	0	247	13	161 813
Type C	0	12	3	77 144

The substance/substance group *Ubidecarenone* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.5000 %)
Type B	100.0000 % (> 99.9928 %)	95.0000 % (> 93.8462 %)
Type C	100.0000 % (> 99.8850 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21247	23881	5.33	56.25
21388	21388	0.00	54.95
22696	22696	0.00	54.98
23127	23127	0.00	55.80
23581	23127	2.40	54.14
23881	23881	0.00	57.06

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Urea**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20017-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Urea; Carbamidum; Urea pura; Ureum

Special notes

When selecting the *Urea* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Urea*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Urea	12F25-N05	20712	40	20120724
Euro OTC	Urea	1404024-01	21537	40	20140519
Caelo	Urea	15154103	22315	40	20150722
Fagron	Urea	14I18-B03-303581	22317	40	20141003
Caelo	Urea	161074	22466	40	20160509*

continued on the next page

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Urea	170216	23033	40	20170202*
Caelo	Urea	15154103	22315SI	40	20150722
Fagron	Urea	14I18-B03-303581	22317SI	40	20141003

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 320 spectra of 8 reference samples from the substance/substance group *Urea*. These samples are listed above in the section *calibration samples*. The reference samples originate from 6 different batches.

- 72 113 spectra from a total of 1576 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 590 spectra from 18 reference samples of the substance/substance group *Urea*.

- These include spectra of independent samples from 8 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Urea	82374239	20017	30
Euro OTC	Urea	1404024-01	21537†	20
Caelo	Urea	15154103	22315†	20
Fagron	Urea	14I18-B03-303581	22317†	20
Euro OTC	Urea	1601044	22376	40
Caelo	Urea	161074	22466†	20

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*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Urea	1604044	22552	40
Euro OTC	Urea	1702023	23156	40
Euro OTC	Urea	1707015	23535	40
Caelo	Urea	180242	24042	40
Caelo	Urea	180230	24043	40
Euro OTC	Urea	1804007	24078	40
Caelo	Urea	15154103	22315SI†	20
Fagron	Urea	14I18-B03-303581	22317SI†	20
Euro OTC	Urea	1604044	22552SI	40
Caelo	Urea	170216	23033SI	40
Euro OTC	Urea	1702023	23156SI	40
Euro OTC	Urea	1804007	24078SI	40

- 161 483 spectra from a total of 3486 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 1644 spectra from 373 *Apo-Ident* customers from 269 batches from the substance/substance group *Urea*.

- These include spectra of independent samples from 260 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Urea	14107109	22
Caelo	Urea	15154110	19
Caelo	Urea	15154112	26
ACM	Urea	KNC1795J14	1
Gehe,05.04.17, 5,30EUR	Urea	16107412	1
Caelo	Urea	13064215	24
Hirsch	Urea	810811	1
Anzag, 12.12.2012	Urea		1
PHOENIX 29.08.2014	Urea		1
Caelo	Urea	14107113	17
Fagron	Urea	235/12I04-N06	1
Caelo	Urea	2324534	1
Caelo	Urea	314Q2544	1
Caelo	Urea	5061410	1
Euro OTC	Urea	72/14	1
Caelo	Urea		11
Caelo	Urea	9240908	1
Euro OTC	Urea	1003024-02	2
Caelo	Urea	10081208	1

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†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Supplier	Substance	Batch	Spectra
Caelo	Urea	10116	1
Caelo	Urea	10169722	1
Caelo	Urea	10169726	2
Caelo	Urea	10169731	2
Caelo	Urea	107063	1
Fagron	Urea	10E31-N06	1
Euro OTC	Urea	1110023-01	1
Sanacorp	Urea	1110023-01	1
Caelo	Urea	1111	1
Caelo	Urea	11120725	1
Caelo	Urea	1113A-025	1
Caelo	Urea	11150701	2
Caelo	Urea	11150702	3
Caelo	Urea	11150703	1
Caesar&loretz,Phoenix	Urea	11150713	1
Caelo	Urea	11150713	1
Caelo	Urea	11150714	2
Noweda	Urea	11150714	1
Bombastus	Urea	11150721	1
Caelo	Urea	11150721	4
Phönix Gotha	Urea	11150721	1
Caesar & Loretz GmbH 40...	Urea	11150722	1
Caelo	Urea	11150722	4
Caelo	Urea	11150725	4
Noweda	Urea	11150725	1
Caelo	Urea	11150731	2
Caesar & Loretz GmbH, 4...	Urea	11150736	1
Caelo	Urea	11150736	7
Caesar&loretz,Anzag	Urea	11150738	1
Caelo	Urea	11150738	2
Caelo	Urea	1150722	1
Euro OTC	Urea	118900	1
Sino Phyto	Urea	118900-0003	1
Fagron	Urea	11C25-N01	1
Fagron	Urea	11D-13-M04	1
Fagron	Urea	11F24-N16	1
Fagron	Urea	11H01-N08	3
Anzag am 07.05.2012	Urea	11H01-N08	1
Caelo	Urea	12101301	1
Caelo	Urea	12111801	7
phönix,19.12.2012	Urea	12111801	1
Caelo	Urea	12111802	10
Caelo	Urea	12111803	1
Caesar & Loretz GmbH, 4...	Urea	12111804	1
Beiersdorf	Urea	12111804	2
Caelo	Urea	12111804	8
Gehe	Urea	12111804	1
Phönix Gotha	Urea	12111806	2
Caelo	Urea	12111806	8
Caesar&loretz,Phoenix	Urea	12111806	3
Klenk	Urea	12111807	1
Caelo	Urea	12111807	9
Noweda	Urea	12111807	1
Caesar&Loretz GmbH D-40...	Urea	12111808	2
Caelo	Urea	12111808	12
Sanacorp	Urea	12111808	2
Caelo	Urea	12111809	16
Phönix	Urea	12111809	1
Phönix 22.04.2013	Urea	12111809	1
Caelo	Urea	1211181	1

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Supplier	Substance	Batch	Spectra
Caelo	Urea	12111810	15
Caesar & Loretz GmbH, 4...	Urea	12111810	2
Gehe	Urea	12111810	1
Sanacorp	Urea	12111810	1
Caelo	Urea	12111820	16
Gehe	Urea	12111820	1
Caelo	Urea	12111822	19
Caesar & Loretz GmbH	Urea	12111822	1
Gehe	Urea	12111822	1
Phönix	Urea	12111822	1
GEHE	Urea	12111822	2
Caesar & Loretz GmbH, 4...	Urea	12111822	1
Caesar/Lorenz	Urea	12111822	1
Caelo	Urea	12111823	11
Caesar/Noweda	Urea	12111823	1
Anzag 17.04.13 ek:6,84EUR	Urea	12111823	1
Alliance Healthcare	Urea	12111823	1
Caelo	Urea	12111826	8
Caesar & Loretz GmbH, 4...	Urea	12111828	2
Caelo	Urea	12111828	22
Caesar u Loretz	Urea	12111828	1
Caelo	Urea	12111834	2
Caelo	Urea	1211802	1
Caelo	Urea	1211804	1
Phönix Gotha	Urea	1211806	1
Caelo	Urea	1211806	1
Caelo	Urea	1211808	1
Caelo	Urea	1211809	1
Caelo	Urea	1211820	1
Fagron	Urea	1211822	2
Caelo	Urea	1211823	1
Sanacorp	Urea	1212007	1
Euro OTC	Urea	121200701	1
Euro OTC	Urea	1212007-01	12
EuRho	Urea	1212007-01	1
Phönix Gotha	Urea	1212007-01	1
Phönix	Urea	1212007-01	1
Euro OTC	Urea		1
Euro OTC	Urea	1212007-02	3
Caelo	Urea	12345	1
Laborchemie Apolda/Jenn...	Urea	12345	1
Caelo	Urea	123456	2
Finze	Urea	1264	1
Caelo	Urea	12C20-N05	1
Fagron	Urea	12C20-N05	1
Anzag, 10.12.2012	Urea	12F25-N05	1
Fagron	Urea	12F25-N05	4
Fagron	Urea	12I04-N06	1
Fagron	Urea	12l04-N06	1
Caelo	Urea	12l04-N06	1
Caelo	Urea	12L10-N08	1
Fagron	Urea	12l10-n08	1
Fagron	Urea	12L10-N08	5
Fagron	Urea	13/17-1302-287602	1
Fagron	Urea	13/17-B02-287602	2
Caelo	Urea	13042015B	1
Caelo	Urea	1306412	1
Caelo	Urea	13064201	6
Noweda/KremerGmbH	Urea	13064201	1
Phönix Gotha	Urea	13064202	1

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Supplier	Substance	Batch	Spectra
Caelo	Urea	13064202	16
Caelo	Urea	13064203	15
Caesar &Loretz GmbH	Urea	13064203	1
Sanacorp	Urea	13064203	1
Großhandel	Urea	13064203	1
Caelo	Urea	13064206	22
Anzag / Noweda	Urea	13064206	1
Caesar & Loretz GmbH, 4...	Urea	13064206	2
Caesar & Loretz GmbH	Urea	13064206	1
Caelo	Urea	13064207	18
Phönix	Urea	13064207	1
Gehe	Urea	13064207	1
Caesar/Noweda	Urea	13064208	1
Caesar & Loretz GmbH	Urea	1306421	1
Caelo	Urea	13064212	29
Caesar & Loretz GmbH, 4...	Urea	13064212	4
ADH, 04.11.2013	Urea	13064212	1
Caelo	Urea	13064213	8
Caelo	Urea	13064214	16
Sanacorp	Urea	13064215	1
Phönix	Urea	13064215	1
Caesar & Loretz GmbH Hi...	Urea	13064215	1
Gehe	Urea	13064215	1
Caesar&Loretz GmbH/Anzag	Urea	13064217	1
Caelo	Urea	13064217	2
Caelo	Urea	13064221	11
Caelo	Urea	13064223	31
Phönix	Urea	13064223	1
Sanacorp	Urea	13064223	1
Caesar & Loretz GmbH	Urea	13064223	1
Caelo	Urea	13064224	2
Caelo	Urea	13064225	1
Caelo	Urea	13064226	14
Caelo	Urea	13064227	6
Caelo	Urea	13064228	25
Caelo	Urea	13064230	15
Caelo	Urea	13064231	12
Cealo/Phönix	Urea	13064231	1
Phoenix	Urea	13064231	1
Caesar&Loretz GmbH/Anzag	Urea	13064231	1
Caelo	Urea	13064232	18
Gehe	Urea	13064232	1
Caelo	Urea	13064233	23
Caelo	Urea	13064236	9
Phönix	Urea	13064236	1
Euro OTC	Urea	13064239	1
Caelo	Urea	13064239	2
Caelo	Urea	13072015B	1
Caelo	Urea	1317B02-287602	1
Anzag/Henry Lamotte	Urea	13-18-B03-303581	1
Caelo	Urea	1364212	1
Fagron	Urea	13D03-N01	10
Phönix 19.06.2013	Urea	13D03-N01	1
Fagron	Urea	13D03-NO01	1
Dr. August Wolff	Urea	13E17N02	1
Fagron	Urea	13E17-N02	1
Fagron	Urea	13E21-N05	4
Caelo	Urea	13E21-N05	1
Fagron	Urea	13J17-B02	2
Fagron	Urea	13J17-B02-287602	2

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Supplier	Substance	Batch	Spectra
Alliance Health 03.05.2...	Urea	13J17-B02-287602	2
Fagron	Urea	13J17-B02-287604	7
Fagron	Urea	13j17-B02-287604	1
Fagron	Urea	13J17B02-287604	1
Raben-Apotheke Mildenau	Urea	13J17-B02-287604	2
Fagron	Urea	13L20B03	1
Raben-Apotheke Mildenau	Urea	13J17-Bo2-287604	1
Fagron	Urea	13L20-B03289708	1
Fagron	Urea	13L20-B03-289708	5
Fagron	Urea	13L20B03289708	1
Caelo	Urea	14/18-B03-303581	2
Fagron	Urea	14/18-B03-303581	6
Fagron	Urea	14/18B03303581	1
Caelo	Urea	14011513	1
Euro OTC	Urea	1404024-01	21
Eurho	Urea	1404024-01	1
Phönix Gotha	Urea	1404024-01	1
Sanacorp	Urea	1405028-01	1
Caelo	Urea	1410701	1
Euro OTC	Urea	14107101	2
Caelo	Urea	14107101	9
Noweda	Urea	14107101	1
Caelo	Urea	14107102	30
Caesar&Loretz GmbH	Urea	14107101	1
Gehe	Urea	14107102	1
Fagron	Urea	14107102	1
Sanacorp	Urea	14107102	1
Phönix	Urea	14107102	1
Caelo	Urea	14107103	11
Caelo	Urea	14107108	11
Bombastus	Urea	14107108	1
Euro OTC	Urea	14107108	1
Phönix	Urea	14107109	1
Ph.Eur.7.0	Urea	14107109	1
Caelo	Urea	14107112	19
Träger	Urea	14107112	1
Sanacorp	Urea	14107112	1
Caeolo/Noweda	Urea	14107112	1
Caesar&Loretz GmbH /Anzag	Urea	14107113	1
Caelo	Urea	14107117	8
Fagron	Urea	14107117	1
Caelo	Urea	14107118	5
Caelo	Urea	14107119	21
Caelo	Urea	14107120	7
Caelo	Urea	14107122	17
Caelo	Urea	1417101	1
Fagron	Urea	1418-B03-303581	1
Fagron	Urea	1418b03303581	1
Fagron	Urea	1418B03303581	1
Caelo	Urea	14197118	1
Fagron	Urea	14E07-B05	10
Fagron	Urea	14E07B05	3
Fagron	Urea	14E07-B05-289706	1
Caelo	Urea	14E07-B05-289706	1
Fagron	Urea	14E07-B05-293469	9
Caelo	Urea	14E07-B05-293469	1
AHD	Urea	14E07-B05-293469	1
Fagron	Urea	14E-07-B05-293469	1
anzag	Urea	14E07-B05-293469	1
Fargon/Alliance HC	Urea	14E07-B05-293469	1

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Supplier	Substance	Batch	Spectra
Fagron	Urea	14E07B05293469	1
Fagron	Urea	14E07-B05-297165	2
Fagron	Urea	14E07-B05-297167	6
Fagron	Urea	14E07-B07-293469	1
Alliance health	Urea	14E07-B05-297167	1
Fagron	Urea	14E8900-0001	1
Fagron	Urea	14I18-B03	4
Caelo	Urea	14I18-B03	1
Fagron	Urea	14I18-B03-303576	4
Fagron	Urea	14I18-B03-303581	5
Caelo	Urea	14I18-B03-303581	1
Fagron	Urea	14l18-B03	1
Fagron	Urea	14l18-B03-0303581	1
Euro OTC	Urea	1503042-01	20
Euro OTC	Urea	150304201	1
Caelo	Urea	1508/104	1
Caelo	Urea	150867103	1
Caelo	Urea	15087102	5
Caelo	Urea	15087103	22
Caesar & Loretz GmbH	Urea	15087103	1
Phönix	Urea	15087103	1
Caelo	Urea	15087104	17
Beyvers/AHD	Urea	15087104	1
Caelo	Urea	15087105	12
Caesar & Loretz GmbH	Urea	15087105	1
Caelo	Urea	15087107	14
Gehe	Urea	15087107	2
Phönix	Urea	15087110	3
Caelo	Urea	15087110	24
Caesar&Loretz GmbH /Anzag	Urea	15087110	1
Caelo	Urea	1514110	2
Euro OTC	Urea	1515404	1
Caelo	Urea	1515404	1
Caelo	Urea	15154103	34
Euro OTC	Urea	15154103	2
Caesar & Loretz GmbH Hi...	Urea	15154103	1
phönix	Urea	15154103	2
Caesar&Loretz/Caesar&Lo...	Urea	15154104	1
Caelo	Urea	15154104	65
Calo/AHD	Urea	15154104	1
Caesar & Loretz GmbH	Urea	15154104	1
Fagron	Urea	15154104	2
Castor/Phönix	Urea	15154104	1
Caelo	Urea	15154107	16
Caelo	Urea	15154109	5
Noweda	Urea	15154110	1
Caelo	Urea	15154111	29
phönix	Urea	15154111	1
Caesar&Loretz GmbH	Urea	15154111	1
Sanacorp	Urea	15154112	2
phönix	Urea	15154112	2
Phoenix	Urea	15154113	1
Caelo	Urea	15154113	14
Phönix	Urea	15154113	1
Caelo	Urea	15154116	6
Caelo	Urea	1517E-02544	1
Euro OTC	Urea	1601044-01	13
Bombastus	Urea	1601044-01	1
Caelo	Urea	160125/2	1
Euro OTC	Urea	1604044-01	18

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Supplier	Substance	Batch	Spectra
Caelo	Urea	16107405	3
Caelo	Urea	16107406	10
Caelo	Urea	16107407	10
Caelo	Urea	16107411	10
Caesar&Loretz GmbH,Phön...	Urea	16107411	1
Caesar & Loretz GmbH	Urea	16107411	1
Caelo	Urea	16107412	23
phönix	Urea	16107412	2
Gehe	Urea	16107412	2
Caelo	Urea	16107413	6
Caelo	Urea	16107416	5
Caelo	Urea	16107417	11
Caesar&Loretz GmbH	Urea	16107417	1
Caelo	Urea	16107418	5
Sanacorp	Urea	16107418	1
Caelo	Urea	16107419	1
Caelo	Urea	16107420	7
phönix	Urea	16107420	1
Caelo	Urea	16107422	4
Gehe	Urea	16107422	1
Phönix	Urea	16107424	1
Caelo	Urea	16107424	1
gehe	Urea	16107425	1
Caelo	Urea	16107426	2
Caelo	Urea	16107425	1
Caelo	Urea	16107428	1
Fagron	Urea	16D22-B02	1
Fagron	Urea	16D22-B02-3221532	1
Fagron	Urea	16D22-B02-322426	1
Fagron	Urea	16D22-B02-322526	2
Caelo	Urea	16D22-B02-322532	1
Fagron	Urea	16D22-B02-322532	2
Fagron	Urea	16D22B02322532	1
Fagron	Urea	16D22-B02-326481	2
Gehe/Fragon	Urea	16D22-B02-326481	1
Fagron	Urea	16I13-B02	1
Fagron	Urea	16I13B02330166	1
Caelo	Urea	17011405	1
Euro OTC	Urea	1702023-01	4
Caelo	Urea	17021601	2
Euro OTC	Urea	1707015-01	1
Caelo	Urea	18024202	1
Caelo	Urea	17101310	1
Caelo	Urea	1807130I	1
Fagron	Urea	18-B03-303581	1
Caelo	Urea	20031514	1
Caelo	Urea	20130912-4	1
Fagron	Urea	2014162937	3
Fagron	Urea	2014376618	1
Fagron	Urea	2016142709	2
Löns Apotheke	Urea	20349	1
Caelo	Urea	21051304	1
Caelo	Urea	2109212544	1
Caelo	Urea	21111806	1
Caelo	Urea	22111305	1
Caelo	Urea	25082015A	1
Caelo	Urea	26071304	1
Fagron	Urea	3613M-02544	1
Caelo	Urea	3012A-02544	1
Caelo	Urea	3413Q-02544	1

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Supplier	Substance	Batch	Spectra
Caelo	Urea	30031304	1
Löns Apotheke	Urea	40003	1
Caelo	Urea	4013Q2544	1
Caelo	Urea	4111M-02544	1
Caelo	Urea	4116M-02544	1
Caelo	Urea	4914I-02544	1
Caelo	Urea	5100	1
Caelo	Urea	5208	1
Caelo	Urea	568900	1
Caelo	Urea	62/AKD49	1
Sanacorp	Urea	62/AKD50s	1
Caelo	Urea	63/AKD4	1
Caelo	Urea	64/AKD7	1
Caelo	Urea	82374179	2
Caelo	Urea	AKD6	1
Sanacorp	Urea		2
Kehr	Urea	CH4N2O	1
Gutenberg-Apotheke	Urea		1
ACM	Urea	KNC0236J16	2
ACM	Urea	KNC0557J15	3
Audor Pharma	Urea	PU145	1
test	Urea	test	1
Phönix Gotha	Urea	V096/2012	1
Sanacorp	Urea	63/AKD1	1
Noweda	Urea	13064223	1
Noweda	Urea	4109M-02544	1
Gehe	Urea	12111808	1
Sanacorp	Urea	12111820	1
Sanacorp	Urea	13064212	1
Caelo	Urea	1306422	1
Gutenberg-Apotheke	Urea	13064227	1
VDL;05.02.15;10.15EUR	Urea	14107113	1
Caelo	Urea	15144112	1
Caelo	Urea	1610407	1
Anzag	Urea	12111801	1
GEHE	Urea	12111802	1
Beiersdorf AG	Urea	14/18-B03-303576	1
Fargon	Urea	14e07-b05-297165	1

- 75 515 spectra from 463 *Apo-Ident* customers from a total of 25 289 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Urea* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Urea* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

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	False positive	True positive	False negative	True negative
Type A	0	320	0	72 113
Type B	0	587	3	161 483
Type C	0	1619	25	75 515

The substance/substance group *Urea* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9887 %)	100.0000 % (> 98.1250 %)
Type B	100.0000 % (> 99.9928 %)	99.4915 % (> 98.9831 %)
Type C	100.0000 % (> 99.8849 %)	98.4793 % (> 98.2968 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20712	22466	6.88	73.80
21537	22466	6.62	74.99
22315	23033	5.56	72.61
22317	22466	5.63	73.17
22466	22466	0.00	73.70
23033	23033	0.00	73.53

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Uridine**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20744-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Uridine; Uridinum

Special notes

When selecting the *Uridine* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Uridine*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Uridine	11G07-N04	20744	55	1402481
Fagron	Uridine	13K18-B31-288497	21895	40	20131129
Audor	Uridine	APIB160018211AU	23529	40	20161118

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 135 spectra of 3 reference samples from the substance/substance group *Uridine*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 298 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 65 spectra from 3 reference samples of the substance/substance group *Uridine*.

- These include spectra of independent samples from 1 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Uridine	11G07-N04	20744†	5
Fagron	Uridine	13K18-B31-288497	21895†	20
Audor Pharma	Uridine	APIB1600169AU	23507	40

- 162 008 spectra from a total of 3496 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 48 spectra from 23 *Apo-Ident* customers from 21 batches from the substance/substance group *Uridine*.

- These include spectra of independent samples from 20 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Uridine	9129-N24	1
Fagron	Uridine	12091402	1
Fagron	Uridine	11G07-N04	1
Fagron	Uridine	13D08-N26	1
Fagron	Uridine	13D29-N06	4
Fagron	Uridine	13D29-NO6	1
Fagron	Uridine	13K18-B31	4
Fagron	Uridine	14051405	1
Fagron	Uridine	14F02-B09	1
Fagron	Uridine	14F02-B09-305467	7
Fagron	Uridine	16101301	1
Fagron	Uridine	22041301	1
Fagron	Uridine	721010040	1
Caelo	Uridine	721110090	4
siehe WE-Prüfprotokoll	Uridine	54/11	1
Phönix	Uridine	721010040	1
Sanacorp	Uridine	AP721060040/5U	1
Audor Pharma	Uridine	AP721060040/5U	2
Audor Pharma	Uridine	APIB1600169AU	2
Audor Pharma	Uridine	APIB1400280AU	1
Audor Pharma	Uridine	APIB1600182AU	3
Audor Pharma	Uridine	AP30514IB1500001AXU	4
Audor Pharma	Uridine	AP30514U	4

- 77 111 spectra from 463 *Apo-Ident* customers from a total of 25 526 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Uridine* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Uridine* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	135	0	72 298
Type B	0	65	0	162 008
Type C	0	47	1	77 111

The substance/substance group *Uridine* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.5556 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 90.7692 %)
Type C	100.0000 % (> 99.8850 %)	97.9167 % (> 91.6667 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20744	20744	0.00	36.55
21895	20744	3.76	36.11
23529	20744	2.95	36.98

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Valine**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20405-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Valine; Valinum

Special notes

When selecting the *Valine* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Valine*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Valine	15A14-B07-307756	21953	40	9198
Euro OTC	Valine	1604055	22571	40	20160601*
Euro OTC	Valine	1701026	23131	40	20170222*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Valine*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 260 spectra from 7 reference samples of the substance/substance group *Valine*.

- These include spectra of independent samples from 6 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Valine	L1006023-01	20405	40
Fagron	Valine	15A14-B07-307756	21953†	20
Euro OTC	Valine	1609009	22799	40
Euro OTC	Valine	1705017	23426	40
Euro OTC	Valine	1710003	23770	40
Euro OTC	Valine	1712005	23867	40
Euro OTC	Valine	1803017	24091	40

- 161 813 spectra from a total of 3492 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 6 spectra from 5 *Apo-Ident* customers from 6 batches from the substance/substance group *Valine*.

- These include spectra of independent samples from 6 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Euro OTC	Valine	L1309029-01	1
Fagron	Valine	121259	1
Euro OTC	Valine	1604055-01	1
Euro OTC	Valine	L1106045-01	1
Euro OTC	Valine	L1309029-02	1
Fagron	Valine	13B13-N05	1

- 77 153 spectra from 463 *Apo-Ident* customers from a total of 25 541 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Valine* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Valine* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	240	20	161 813
Type C	0	5	1	77 153

The substance/substance group *Valine* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	92.3077 % (> 91.1538 %)
Type C	100.0000 % (> 99.8852 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several

new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21953	21953	0.00	62.00
22571	22571	0.00	66.02
23131	23131	0.00	61.24

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Vancomycin hydrochloride**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	21748-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Vancomycin hydrochloride; Vancomycini hydrochloridum

Special notes

When selecting the *Vancomycin hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Vancomycin hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Vancomycin hydro…	1407047-01	21748	40	AR-15-FG-008950-01
Euro OTC	Vancomycin hydro…	1506029	21826	40	AR-15-FG-009077-01
Euro OTC	Vancomycin hydro…	1610038	22878	40	20161208*
Audor	Vancomycin hydro…	APHAP1609006EV	23532	40	AR-18-FG-000670-01
Fagron	Vancomycin hydro…	17I18-B08-340944	24010	40	20171109

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 200 spectra of 5 reference samples from the substance/substance group *Vancomycin hydrochloride*. These samples are listed above in the section *calibration samples*. The reference samples originate from 5 different batches.

- 72 233 spectra from a total of 1577 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 280 spectra from 7 reference samples of the substance/substance group *Vancomycin hydrochloride*.

- These include spectra of independent samples from 1 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Vancomycin hydrochloride	1407047-01	21748†	20
Euro OTC	Vancomycin hydrochloride	1506029	21826†	20
Euro OTC	Vancomycin hydrochloride	1604037	22891	40
Euro OTC	Vancomycin hydrochloride	1407047-01	21748SI	60
Euro OTC	Vancomycin hydrochloride	1506029	21826SI	60
Euro OTC	Vancomycin hydrochloride	1610038	22878SI	40
Euro OTC	Vancomycin hydrochloride	1604037	22891SI	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 793 spectra from a total of 3495 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 0 spectra from 0 *Apo-Ident* customers from 0 batches from the substance/substance group *Vancomycin hydrochloride*.

- These include spectra of independent samples from 0 batches, of which no spectra have been used for the generation of the database.

- 77 159 spectra from 463 *Apo-Ident* customers from a total of 25 547 batches from a further 701 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Vancomycin hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Vancomycin hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	200	0	72 233
Type B	0	174	106	161 793
Type C	0	0	0	77 159

The substance/substance group *Vancomycin hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9928 %)	62.1429 % (> 61.0714 %)
Type C	100.0000 % (> 99.8849 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21748	21748	0.00	26.98
21826	21826	0.00	33.85
22878	22878	0.00	30.38
23532	23532	0.00	28.92
24010	23532	12.55	27.71

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Vanillin**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20204-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Vanillin; Vanillinum

Special notes

When selecting the *Vanillin* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Vanillin*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Vanillin	14044413	21737	40	20140227
Fagron	Vanillin	13J01-N07	21738	40	20130926
Caelo	Vanillin	15135302	21924	40	AR-17-FG-022168-03
Caelo	Vanillin	160895	22484	40	20160421*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 4 reference samples from the substance/substance group *Vanillin*. These samples are listed above in the section *calibration samples*. The reference samples originate from 4 different batches.

- 72 273 spectra from a total of 1578 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 280 spectra from 9 reference samples of the substance/substance group *Vanillin*.

- These include spectra of independent samples from 5 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Vanillin	10L22-N17	20204	40
Fagron	Vanillin	07F29-N07	20217	40
Caelo	Vanillin	14044413	21737†	20
Fagron	Vanillin	13J01-N07	21738†	20
Caelo	Vanillin	15135302	21924†	20
Caelo	Vanillin	160895	22484†	20
Caelo	Vanillin	171172	23308	40
Caelo	Vanillin	17117201	23561	40
Caelo	Vanillin	173088	23805	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 793 spectra from a total of 3490 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 68 spectra from 54 *Apo-Ident* customers from 38 batches from the substance/substance group *Vanillin*.

- These include spectra of independent samples from 36 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	Vanillin	314Q2548	1
Dr.Hollborn	Vanillin	6082015	1
Fagron	Vanillin	8L05-N07	1
Caelo	Vanillin	10066811	1
Caesar & Loretz GmbH D-...	Vanillin	10066830	1
Caelo	Vanillin	10066830	2
Fagron	Vanillin	10L22-N17	1
Caelo	Vanillin	112901	1
Fagron	Vanillin	11G28-N09	1
Caelo	Vanillin	12071401	1
Caesar & Loretz GmbH, 4...	Vanillin	12079401	1
Gehe	Vanillin	12079412	1
Caelo	Vanillin	12079412	3
Caesar & Loretz GmbH, 4...	Vanillin	12079412	1
Caelo	Vanillin	12079410	1
Caelo	Vanillin	12079417	1
Caelo	Vanillin	12079424	2
Caelo	Vanillin	12079428	1
Rhodia GmbH/Noweda	Vanillin	12D02-N03	1
Caelo	Vanillin	12h09-n06	1
Fagron	Vanillin	12H09-N06	3
Sanacorp	Vanillin	12H09-N06	1
Fagron	Vanillin	12Ko7-N19	1
Hedinger/Ebert	Vanillin	13A30-N10	1
fargron	Vanillin	13/01-N07	1
Fagron	Vanillin	13I01-N07	1
Fagron	Vanillin	13J01-N07	6
Caelo	Vanillin	14044419	1
Fagron	Vanillin	14G02-B99-296988	1
Caelo	Vanillin	15135302	2
Caelo	Vanillin		1
Caelo	Vanillin	15154006	1
Caelo	Vanillin	15154014	3
Gehe/Noweda	Vanillin	15154006	1
Caelo	Vanillin	15154020	6
Caelo	Vanillin	15227317	1
Caelo	Vanillin	16089501	1
Caelo	Vanillin	16089506	5

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Supplier	Substance	Batch	Spectra
Gehe	Vanillin	16089506	1
Fagron	Vanillin	232050-0004	1
Caelo	Vanillin	90961269	1
Fagron	Vanillin	13/01-N07	1
Caelo	Vanillin	12079407	1
Caelo	Vanillin	14044404	1
Caelo	Vanillin	15154017	1

- 77 091 spectra from 463 *Apo-Ident* customers from a total of 25 511 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Vanillin* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Vanillin* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	160	0	72 273
Type B	0	280	0	161 793
Type C	0	66	2	77 091

The substance/substance group *Vanillin* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 97.8571 %)
Type C	100.0000 % (> 99.8850 %)	97.0588 % (> 92.6471 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

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Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21737	21924	3.72	28.51
21738	21924	4.37	28.40
21924	21924	0.00	27.35
22484	22484	0.00	29.30

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Waxes / Fats**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20747-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Waxes / Fats; Adeps solidus; Adeps solidus W35; Cacao oleum; Cera alba; Cera flava; Cetyl palmitate 15; Cetylis palmitas 15; Cetylium palminicum 15; Cocoa butter; Hard fat in pastilles; Hard fat W35; Microcrystalline wax; Natrii laurylsulfuricum; Oleum cacao; Paraffin, hard; Paraffin, microcrystalline; Paraffinum durum in rotulis; Paraffinum microcristallinum; Paraffinum solidum in rotulis; Sodium dodecyl sulfate; Sodium dodecyl sulphate; Wax, bleached; Wax, yellow

Special notes

When selecting the *Waxes / Fats* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Waxes / Fats*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Spinnrad	Wax, bleached	1012402004	20747	40	20121101

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Cetyl palmitate 15	12331916	20865	40	1402429
Caelo	Sodium dodecyl s…	13099011	20986	40	1403108
Caelo	Hard fat in past…	12158122	21067	40	20120627
Caelo	Wax, yellow	13335507	21433	40	20131011
Caelo	Cocoa butter	13292013	21482	40	20130924
Caelo	Wax, bleached	13378619	21483	20	1509364
Caelo	Paraffin, microc…	14307104	21682	40	AR-15-FG-005277-01
Caelo	Paraffin, hard	13390413	21731	40	20131213
Caelo	Paraffin, microc…	14307106	21766	40	20141014
Caelo	Cetyl palmitate 15	14351606	21875	40	20141219
Fagron	Hard fat W35	15A07-B12-302751	21880	40	1604639
Caelo	Cetyl palmitate 15	15301703	21984	40	AR-16-FG-007435-01
Caelo	Wax, bleached	14336620	22244	40	20141125
Caelo	Wax, yellow	15317602	22245	40	20151007
Caelo	Cetyl palmitate 15	15301703	22325	40	20151013
Caelo	Paraffin, microc…	154128	22330	40	20160112*
Fagron	Hard fat W35	15A07-B12-309245	22338	40	20150115
Caelo	Cocoa butter	14348906	22348	40	20150122
Caelo	Paraffin, hard	15232004	22349	40	1702507
Caelo	Sodium dodecyl s…	15344503	22352	40	20151022
Caelo	Hard fat in past…	160278	22479	40	20160407*
Caelo	Cetyl palmitate 15	160538	22486	40	20160323*
Caelo	Wax, yellow	162750	22767	40	20161007*
Caelo	Wax, bleached	15292022	22956	40	20150827
Caelo	Cocoa butter	163165	23067	40	20161116*
Caelo	Sodium dodecyl s…	16229217	23242	40	20160809
Caelo	Sodium dodecyl s…	170955	23278	40	20170503*
Bombastus	Hard fat in past…	306363	23565	34	20161213
Fagron	Hard fat W35	16K08-B10-334910	23601	40	20161229
Caelo	Cocoa butter	17055907	23707	33	20170310

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 1207 spectra of 31 reference samples from the substance/substance group *Waxes / Fats*. These samples are listed above in the section *calibration samples*. The reference samples originate from 30 different batches.

- 71 226 spectra from a total of 1552 batches from further 357 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 1573 spectra from 49 reference samples of the substance/substance group *Waxes / Fats*.

- These include spectra of independent samples from 28 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Wax, yellow	83038199	20033	30
Caelo	Cocoa butter	81070139	20035	70
Caelo	Hard fat in pastilles	10158804	20174	40
Caelo	Sodium dodecyl sulfate	10229510	20237	40
Caelo	Wax, yellow	11285001	20338	40
Caelo	Hard fat in pastilles	09318225	20339	40
Caelo	Paraffin, microcrystalline	11100708	20400	40
Caelo	Paraffin, hard	11166916	20461	40
Caelo	Paraffin, hard	11166911	20532	40
Caelo	Wax, bleached	10364838	20610	40
zu erfassen	Cocoa butter	zu erfassen	21014	40
zu erfassen	Cocoa butter	zu erfassen	21015	40
Caelo	Cetyl palmitate 15	13295919	21316	20
Caelo	Wax, yellow	13335507	21433†	20
Caelo	Sodium dodecyl sulfate	13411305	21465	60
Caelo	Cetyl palmitate 15	13295919	21522	40
Caelo	Paraffin, microcrystalline	14307104	21682†	20
Caelo	Paraffin, hard	13390413	21731†	20
Caelo	Paraffin, microcrystalline	14307106	21766†	20
Caelo	Cetyl palmitate 15	14351606	21875†	20
Fagron	Hard fat W35	15A07-B12-302751	21880†	20
Caelo	Cetyl palmitate 15	15301703	21984†	20
Caelo	Wax, bleached	14336620	22244†	20
Caelo	Wax, yellow	15317602	22245†	20
Caelo	Cetyl palmitate 15	15301703	22325†	20
Caelo	Paraffin, microcrystalline	154128	22330†	20
Fagron	Hard fat W35	15A07-B12-309245	22338†	20
Caelo	Cocoa butter	14348906	22348†	20
Caelo	Paraffin, hard	15232004	22349†	20
Caelo	Sodium dodecyl sulfate	15344503	22352†	20
Caelo	Hard fat in pastilles	160278	22479†	20
Caelo	Cetyl palmitate 15	160538	22486†	20
Caelo	Wax, bleached	161631	22587	40
Fagron	Hard fat W35	15J08-B04-324959	22806	40
Caelo	Paraffin, hard	16277704	23190	40
Caelo	Sodium dodecyl sulfate	16229205	23243	40
Klenk	Wax, yellow	0290A170314	23511	40
Caelo	Wax, yellow	17011602	23512	40
Caelo	Wax, bleached	16163109	23513	40
Caelo	Cetyl palmitate 15	17043503	23560	40
Bombastus	Hard fat in pastilles	306363	23565†	6

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Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Cetyl palmitate 15	171640	23639	40
Caelo	Sodium dodecyl sulfate	172363	23664	40
Bombastus	Hard fat in pastilles	308558	23705	40
Caelo	Cocoa butter	17055907	23707[†]	7
Caelo	Paraffin, microcrystalline	15412801	23724	40
Caelo	Cocoa butter	173149	23795	40
Caelo	Hard fat in pastilles	173076	23814	40
Caelo	Cetyl palmitate 15	172715	23817	40

- 160 500 spectra from a total of 3454 batches from further 855 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 1703 spectra from 274 *Apo-Ident* customers from 566 batches from the substance/substance group *Waxes / Fats*.

- These include spectra of independent samples from 543 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Hard fat in pastilles	14126203	7
Caelo	Hard fat in pastilles	16274201	6
Caelo	Hard fat in pastilles	P182/14	1
Caelo	Hard fat in pastilles	16027801	3
Caelo	Hard fat in pastilles	11109616	1
Caelo	Hard fat in pastilles	11345905	4
Caelo	Hard fat in pastilles	13243301	5
Caelo	Hard fat in pastilles	12158104	5
Caelo	Hard fat in pastilles	13243411	4
Bombastus	Hard fat in pastilles	277212	2
Caelo	Hard fat in pastilles	1909E-02328	1
Caelo	Wax, yellow	15023006	4
Caelo	Wax, yellow	15317608	6
Caelo	Wax, yellow	15317613	5
Caelo	Wax, yellow	15317611	1
Caelo	Wax, yellow	16038203	5
Caelo	Wax, yellow	16038206	7
Caelo	Wax, yellow	17011612	2
Caelo	Wax, yellow	16038210	2
Caelo	Wax, yellow	1701611	1
Caelo	Cocoa butter	11117816	3
Caelo	Cocoa butter	11079612	2
Caelo	Cocoa butter	12040802	1

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[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Supplier	Substance	Batch	Spectra
Caelo	Cocoa butter	12342003	8
Bombastus	Wax, yellow	267702	2
Klenk	Wax, yellow	280A130115	25
Klenk	Wax, yellow	280A140306	8
Klenk	Wax, yellow	280A150528	4
Klenk	Wax, yellow	290A120627	5
Caelo	Wax, yellow	1214816	1
Caelo	Wax, yellow	12124810	8
Caelo	Wax, yellow	11017318	3
Caelo	Wax, yellow	12257009	9
Caelo	Wax, yellow	12367904	4
Caelo	Wax, yellow	12367901	14
Caelo	Wax, yellow	12367916-3429311150	1
Caelo	Wax, yellow	12367916	6
Fagron	Wax, yellow	12D23-N05	2
Caelo	Wax, yellow	13378602	1
Caelo	Wax, yellow	13031206	9
Caelo	Wax, yellow	13335517	5
Caelo	Wax, yellow	14189912	3
Caesar & Loretz GmbH	Wax, yellow	13031221	1
Bombastus	Wax, yellow	279999	1
Caelo	Wax, yellow	14336607	9
Bombastus	Wax, yellow	285109	1
Caelo	Wax, yellow	15292003	3
Caelo	Wax, yellow	1436607	1
Caelo	Wax, yellow	P146/14	1
Caelo	Wax, bleached	14336620	1
Caelo	Wax, bleached	15292009	2
Caelo	Wax, bleached	1529003	1
Gehe	Cetyl palmitate 15	8209646	1
Caelo	Cetyl palmitate 15	13131914	4
Caelo	Cetyl palmitate 15	14351602	3
Anzag	Cetyl palmitate 15	12018208	1
Caelo	Cetyl palmitate 15	13295919	15
Caelo	Cetyl palmitate 15	12228818	5
Caelo	Cetyl palmitate 15	12331916	10
Caelo	Cetyl palmitate 15	13131911	2
Caelo	Cetyl palmitate 15	11021502	1
Caelo	Cetyl palmitate 15	13295910	8
Caesar/Noweda	Cetyl palmitate 15	13295909	1
Caelo	Cetyl palmitate 15	13131906	11
Phönix	Cetyl palmitate 15	13295919	1
Caelo	Cetyl palmitate 15	14041505	1
Caelo	Cetyl palmitate 15	13295921	1
Caelo	Cetyl palmitate 15	14060705	6
Caelo	Cetyl palmitate 15	14060706	8
Phoenix	Cetyl palmitate 15	14060705	1
Caelo	Cetyl palmitate 15	14060709	6
Caelo	Cetyl palmitate 15	14213705	3
Caelo	Cetyl palmitate 15	14213706	1
Caelo	Cetyl palmitate 15	14213709	4
Caesar u Loretz	Cetyl palmitate 15	14213710	1
Apotärze	Cetyl palmitate 15	1421371	1
Caelo	Cetyl palmitate 15	14213710	2
Caelo	Cetyl palmitate 15	14351601	2
Caelo	Cetyl palmitate 15	14351606	3
Caelo	Cetyl palmitate 15	14351607	1
Caelo	Cetyl palmitate 15	14351609	3
Fargon/Alliance HC	Cetyl palmitate 15	14351612	1
Caelo	Cetyl palmitate 15	14351612	12

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Supplier	Substance	Batch	Spectra
coelo/Sana	Cetyl palmitate 15	14351612	1
Caelo	Cetyl palmitate 15	14351614	1
Caelo	Cetyl palmitate 15	15301701	5
Caelo	Cetyl palmitate 15	15137202	1
Caesar/Noweda	Cetyl palmitate 15	15301701	1
Caelo	Cetyl palmitate 15	15301703	8
Caelo	Cetyl palmitate 15	15301704	3
Caelo	Cetyl palmitate 15	15301705	4
Caelo	Cetyl palmitate 15	15301709	4
Alliance H.	Cetyl palmitate 15	15301709	1
Caelo	Cetyl palmitate 15	15301711	3
Caelo	Cetyl palmitate 15	16053803	8
Fischer/Phönix	Cetyl palmitate 15	15301711	1
Caelo	Cetyl palmitate 15	15632	1
Caelo	Cetyl palmitate 15	16053804	1
Caelo	Cetyl palmitate 15	16053805	2
Caelo	Cetyl palmitate 15	16053811	5
Caelo	Cetyl palmitate 15	16186805	7
Caesar & Loretz GmbH	Cetyl palmitate 15	16186805	1
Sanacorp	Cetyl palmitate 15	16186805	1
Caelo	Cetyl palmitate 15	16186809	3
Caelo	Cetyl palmitate 15	16186806	1
Caelo	Cetyl palmitate 15	17043503	1
Caelo	Cetyl palmitate 15	17164005	1
sanacorp	Cetyl palmitate 15	8/AKD14	1
Sanacorp	Cetyl palmitate 15	8/AKD13	1
Caesar & Loretz GmbH	Cetyl palmitate 15	10068402	2
Caelo	Cetyl palmitate 15		1
Caelo	Cetyl palmitate 15	8/AKD16	1
Caelo	Cetyl palmitate 15	10068410	1
Caelo	Cetyl palmitate 15	11042019	2
Caelo	Cetyl palmitate 15	11216007	1
Caelo	Cetyl palmitate 15	12018204	4
Caelo	Cetyl palmitate 15	12018204/Int212191	1
Caelo	Cetyl palmitate 15	12018204c	1
Gehe	Cetyl palmitate 15	11216007	1
Caelo	Cetyl palmitate 15	12018208	10
Caelo	Cetyl palmitate 15	12018215	1
Caelo	Cetyl palmitate 15	12082901	1
Caesar/Noweda	Cetyl palmitate 15	12124811	3
Caelo	Cetyl palmitate 15	122228801/Int212191	1
Caelo	Cetyl palmitate 15	12228808	4
Caesar/Noweda	Cetyl palmitate 15	12228801	1
Caelo	Cetyl palmitate 15	12228805	1
Euro OTC	Cetyl palmitate 15	12228808	1
Kehr	Cetyl palmitate 15	12228818	1
Phönix Gotha	Cetyl palmitate 15	12331916	1
Caelo	Cetyl palmitate 15	1228808	1
Phönix, 04.09.13	Cetyl palmitate 15	12331916	1
Fagron	Cetyl palmitate 15	12C27-N07	2
Caelo	Cetyl palmitate 15	12331919	2
Caelo	Cetyl palmitate 15	12D19-No2	1
Fagron	Cetyl palmitate 15	12D19-NO2	1
Fagron	Cetyl palmitate 15	12D19-N02	1
Caelo	Cetyl palmitate 15	1313190	1
Caelo	Cetyl palmitate 15	13131905	3
Alliance Healthcare	Cetyl palmitate 15	13131905	1
Phönix	Cetyl palmitate 15	13131906	1
gepepharm/Kehr	Cetyl palmitate 15	13295919	1
gehe	Cetyl palmitate 15	13295919	1

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Supplier	Substance	Batch	Spectra
Nachprüfung	Cetyl palmitate 15	3012U01241	1
Caelo	Cetyl palmitate 15	26071201	1
Caelo	Cetyl palmitate 15	30101301	1
Sanacorp	Cetyl palmitate 15	8/AKD12	1
Caelo	Hard fat in pastilles	12158119	1
Fagron	Hard fat in pastilles	12G04-N18	1
Fagron	Hard fat in pastilles	13243301	1
Caelo	Hard fat in pastilles	13243401	1
Caelo	Hard fat in pastilles	13243403	7
Caelo	Hard fat in pastilles	13243409	3
Caelo	Hard fat in pastilles	13243412	2
Caelo	Hard fat in pastilles	13243418	4
Caelo	Hard fat in pastilles	13243419	3
Caelo	Hard fat in pastilles	13243420	1
Caelo	Hard fat in pastilles	1412602	1
Caelo	Hard fat in pastilles	14126202	5
Caesar/Noweda	Hard fat in pastilles	14126203	1
Caelo	Hard fat in pastilles	14126204	2
Caelo	Hard fat in pastilles	14126209	2
Caelo	Hard fat in pastilles	14126205	1
Caelo	Hard fat in pastilles	14126210	3
Caelo	Hard fat in pastilles	14126216	3
Caelo	Hard fat in pastilles	14126217	3
Caelo	Hard fat in pastilles	14126218	2
Caelo	Hard fat in pastilles	14338703	2
sanacorp	Hard fat in pastilles	14338703	1
Caelo	Hard fat in pastilles	14338704	2
Caelo	Hard fat in pastilles	14338705	1
Caelo	Hard fat in pastilles	14338706	1
Caelo	Hard fat in pastilles	14338707	3
Caelo	Hard fat in pastilles	14338708	2
Caelo	Hard fat in pastilles	14338711	2
Fagron	Hard fat in pastilles	14G03-B03-296731	1
Fagron	Hard fat in pastilles	14L01-B06-303380	3
Caelo	Hard fat in pastilles	15111402	1
Caelo	Hard fat in pastilles	15185002	17
Cae4lo	Hard fat in pastilles	15185002	1
Rondell Apotheke	Hard fat in pastilles	15185002	1
Caelo	Hard fat in pastilles	15185003	7
Caelo	Hard fat in pastilles	15185005	11
Euro OTC	Hard fat in pastilles	15185005	1
Caelo	Hard fat in pastilles	15185007	1
Caelo	Hard fat in pastilles	15185009	4
Caelo	Hard fat in pastilles	1518505	1
Bombastus	Hard fat in pastilles	1518509	1
Fagron	Hard fat in pastilles	15F03-B06	4
Fagron	Hard fat in pastilles	15F03-B06-308708	3
Caelo	Hard fat in pastilles	16021503	1
Sanacorp	Hard fat in pastilles	16274202	1
Caelo	Hard fat in pastilles	16274202	1
Caelo	Hard fat in pastilles	16274203	2
Caelo	Hard fat in pastilles	16274205	1
Caelo	Hard fat in pastilles	17041401	1
Bombastus	Hard fat in pastilles	287293	1
Bombastus	Hard fat in pastilles	287287	1
Bombastus	Hard fat in pastilles	293848	6
Bombastus	Hard fat in pastilles	302709	1
Bombastus	Hard fat in pastilles	306363	4
Bombastus	Hard fat in pastilles	263489	1
Caelo	Hard fat in pastilles	11109617	1

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Supplier	Substance	Batch	Spectra
Caelo	Hard fat in pastilles	11109623	3
Caelo	Hard fat in pastilles	11285001	2
sanacorp	Hard fat in pastilles	267773	1
Caelo	Hard fat in pastilles	7101304	1
Caelo	Hard fat in pastilles	10158813	1
Purren Apotheke	Hard fat in pastilles	10I03-N08	1
Caesar&Loretz GmbH D-40...	Hard fat in pastilles	11109617	1
Caelo	Hard fat in pastilles	11345904	1
Noweda	Hard fat in pastilles	11345909	1
Caelo	Hard fat in pastilles	11345909	2
Caelo	Hard fat in pastilles	11345917	5
Caelo	Hard fat in pastilles	11345918	8
phönix, 19.12.2012	Hard fat in pastilles	11345918	1
Anzag 17.01.2013	Hard fat in pastilles	11345918	1
Caesar & Loretz GmbH, 4...	Hard fat in pastilles	11345918	1
Gehe	Hard fat in pastilles	11345918	1
Caelo	Hard fat in pastilles	1135917	2
Caelo	Hard fat in pastilles	12111204	1
Caesar & Loretz GmbH D-...	Hard fat in pastilles	12158104	1
Caelo	Hard fat in pastilles	12158109	3
Caelo	Hard fat in pastilles	12158114	4
Caelo	Hard fat in pastilles	12158115	7
Fagron	Hard fat in pastilles	12158115	2
Caelo	Hard fat in pastilles	12158122	3
Fagron	Hard fat in pastilles	12K01-N12	2
Gehe	Hard fat in pastilles	13243403	1
Caesar & Loretz GmbH, 4...	Hard fat in pastilles	13243403	1
Caelo	Hard fat in pastilles	13243414	1
Fagron	Hard fat in pastilles	13D10-N06	1
Sanacorp	Hard fat in pastilles	14126203	1
Caelo	Hard fat in pastilles	24011302	1
Caelo	Hard fat in pastilles	2511A-02328	1
Bombastus	Hard fat in pastilles	273759	1
Phönix	Hard fat in pastilles	277212	1
China Medica	Hard fat in pastilles	3244303	1
Fargon	Hard fat in pastilles	41319264	1
Bombastus	Hard fat in pastilles	60084402	1
Caelo	Hard fat in pastilles	90915429	1
Caelo	Hard fat in pastilles		1
Fagron	Hard fat W35	15J08-B04	1
Fagron	Hard fat W35	15J08-B04-322726	1
Noweda	Hard fat W35	16027801	1
Bombastus	Hard fat W35	302709	1
Phoenix	Hard fat W35	16k08-b10-332763	1
Caelo	Paraffin, hard	10194101	2
Fagron	Hard fat W35	3914E-02328	1
Unisan	Paraffin, hard	11166911	1
Caelo	Paraffin, hard	123654	1
Caelo	Paraffin, hard	13109213	5
Caelo	Paraffin, hard	13109214	6
Caelo	Paraffin, hard	13109218	1
Caelo	Paraffin, hard	13109224	5
Euro OTC	Paraffin, hard	13109224	1
Caelo	Paraffin, hard	13390403	1
Caelo	Paraffin, hard	13390406	5
Caelo	Paraffin, hard	13390408	1
Caelo	Paraffin, hard	13390413	1
Caelo	Paraffin, hard	13390415	2
Phoenix goettingen 09.05	Paraffin, hard	13390415	1
Caelo	Paraffin, hard	14126202	1

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Supplier	Substance	Batch	Spectra
Caelo	Paraffin, hard	14286502	1
Caelo	Paraffin, hard	14286504	1
Caelo	Paraffin, hard	14286511	2
Caelo	Paraffin, hard	14286517	4
Noweda	Paraffin, hard	14286517	1
Fagron	Paraffin, hard	14L01-B06	2
Caelo	Paraffin, hard	1523002	1
Caelo	Paraffin, hard	152320004	1
Caelo	Paraffin, hard	15232001	1
Caelo	Paraffin, hard	15232004	3
Caelo	Paraffin, hard	15295405	4
Caelo	Paraffin, hard	15295406	1
GEHE	Paraffin, hard	15295409	1
Phoenix	Paraffin, hard	15295410	1
Gehe	Paraffin, hard	15295410	1
Cealo/AHD	Paraffin, hard	15295411	2
Caelo	Paraffin, hard	15295414	4
Caelo	Paraffin, hard	16000903	2
Caelo	Paraffin, hard	16000910	2
Caelo	Paraffin, hard	16000911	1
Caelo	Paraffin, hard	16000912	1
Caelo	Paraffin, hard	16000922	2
Caelo	Paraffin, hard	16277704	1
Bombastus	Paraffin, hard	293848	1
Caelo	Paraffin, hard	10194106	1
Caelo	Paraffin, hard	11021202	1
Caelo	Paraffin, hard	11166911	1
Kehr	Paraffin, hard	11166916	1
Caelo	Paraffin, hard	11363205	1
Caelo	Paraffin, hard	11363206	2
Noweda	Paraffin, hard	11363206	1
Caelo	Paraffin, hard	12252205	2
Caelo	Paraffin, hard	11363220	3
Caelo	Paraffin, hard	12252206	1
Caelo	Paraffin, hard	12252211	5
Caelo	Paraffin, hard	12252221	3
Caelo	Paraffin, hard	13109203	4
Caelo	Paraffin, hard	13109221	1
Caelo	Cocoa butter	13140404	24
Caelo	Cocoa butter	13140405	4
Caelo	Cocoa butter	13140407	21
sanacorp	Cocoa butter	13140407	1
Euro OTC	Cocoa butter	13140409	1
Caelo	Cocoa butter	13140409	1
Caelo	Cocoa butter	13292001	2
Caelo	Cocoa butter	13292006	4
Caelo	Cocoa butter	13292007	12
Caelo	Cocoa butter	13292011	2
Caelo	Cocoa butter	13292012	3
Caelo	Cocoa butter	13292013	9
Caelo	Cocoa butter	14045104	21
Caelo	Cocoa butter	14123611	6
Caelo	Cocoa butter	14123609	1
Caelo	Cocoa butter	14123617	4
Caelo	Cocoa butter	14123620	5
Caelo	Cocoa butter	14348906	7
Caelo	Cocoa butter	14123621	1
AHD	Cocoa butter	14348906	1
Caelo	Cocoa butter	14348908	2
Caelo	Cocoa butter	14348909	2

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Supplier	Substance	Batch	Spectra
Caelo	Cocoa butter	15088903	1
Caelo	Cocoa butter	15088904	1
Caelo	Cocoa butter	15246102	2
Caelo	Cocoa butter	16316501	3
Caelo	Cocoa butter	16316503	4
Caelo	Cocoa butter	16316508	6
Caelo	Cocoa butter	16316509	1
Caelo	Cocoa butter	17055902	1
Caelo	Cocoa butter	17055907	2
Caelo	Cocoa butter		1
Sanacorp	Cocoa butter	AKD28	1
Herbasinica	Cocoa butter		2
Caelo	Cocoa butter	11034718	1
ACM	Cocoa butter	KNC1605J15	1
Caelo	Cocoa butter	103276705	1
Euro OTC	Cocoa butter	11079604	1
Caelo	Cocoa butter	11034719	1
Caelo	Cocoa butter	11117806	2
Caelo	Cocoa butter	11117813	1
Noweda	Cocoa butter	11117813	2
Caelo	Cocoa butter	11117820	1
Caelo	Cocoa butter	12040803	3
Caelo	Cocoa butter	12040807	2
Caelo	Cocoa butter	12040810	1
Caelo	Cocoa butter	12270201	2
Caelo	Cocoa butter	12270202	27
Caelo	Cocoa butter	12270203	5
Caelo	Cocoa butter	12270205	5
Caelo	Cocoa butter	12270206	11
Caelo	Cocoa butter	12270209	1
Caelo	Cocoa butter	12270210	2
Caelo	Cocoa butter	12270212	10
Caelo	Cocoa butter	13027202	5
Anzag	Cocoa butter	12342004	1
Caelo	Cocoa butter	12342004	1
Caelo	Cocoa butter	13027204	4
Caelo	Cocoa butter	13027203	1
Caelo	Cocoa butter	13027207	5
Sanacorp	Cocoa butter	13027207	1
Caelo	Cocoa butter	13027221	5
Caelo	Cocoa butter	13027224	5
gehe 26.08.13	Cocoa butter	13027221	1
Caelo	Cocoa butter	13027226	4
Caelo	Cocoa butter	13027227	3
Caelo	Cocoa butter	13140401	1
Caelo	Cocoa butter	13140402	1
Caelo	Cocoa butter	13140406	3
Cealo / Noweda	Cocoa butter	13292011	1
Caelo	Cocoa butter	1392013	1
Spinnrad	Cocoa butter	512300202	1
Caelo	Cocoa butter	71326048	2
Sanacorp	Cocoa butter	AKD27	1
Caelo	Paraffin, microcrystalline	13274303	6
Caelo	Paraffin, microcrystalline	14307106	1
Caelo	Paraffin, microcrystalline	52622395	1
Caelo	Sodium dodecyl sulfate	12153010	3
Gehe	Sodium dodecyl sulfate	14127404	1
Caelo	Sodium dodecyl sulfate	13411302	2
Caelo	Sodium dodecyl sulfate	14127411	1
Caelo	Sodium dodecyl sulfate	13411304	1

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Supplier	Substance	Batch	Spectra
Caelo	Sodium dodecyl sulfate	13411305	3
Caelo	Sodium dodecyl sulfate	14127406	2
Caelo	Sodium dodecyl sulfate	14224206	1
Caelo	Sodium dodecyl sulfate	14283904	3
Caelo	Sodium dodecyl sulfate	15095403	1
Caelo	Sodium dodecyl sulfate	15095404	1
Caelo	Sodium dodecyl sulfate	15119907	3
Caelo	Sodium dodecyl sulfate	15344503	2
Caelo	Sodium dodecyl sulfate	15344505	2
Ichthyol/Phönix	Sodium dodecyl sulfate	15344510	1
Caelo	Sodium dodecyl sulfate	15344510	3
Caelo	Sodium dodecyl sulfate	15344511	2
Caelo	Sodium dodecyl sulfate	15344515	2
Fagron	Sodium dodecyl sulfate	16229205	1
Caelo	Sodium dodecyl sulfate	16229205	1
Caelo	Sodium dodecyl sulfate	16229206	4
Caelo	Sodium dodecyl sulfate	16229209	1
Caelo	Sodium dodecyl sulfate	16229213	2
Caelo	Sodium dodecyl sulfate	16229218	1
Caelo	Sodium dodecyl sulfate	26031508	1
Caelo	Sodium dodecyl sulfate	13014604	2
Caelo	Sodium dodecyl sulfate	13014606	1
Caelo	Sodium dodecyl sulfate	13099006	3
Caelo	Sodium dodecyl sulfate	13099008	1
Caelo	Sodium dodecyl sulfate	13099011	3
Caelo	Sodium dodecyl sulfate	16229217	1
Intern Drogen	Sodium dodecyl sulfate	216991080	1
Caelo	Sodium dodecyl sulfate	16229220	1
Sanacorp	Sodium dodecyl sulfate	5/AKD1	1
Sanacorp	Sodium dodecyl sulfate	5/AKD6	1
Caelo	Sodium dodecyl sulfate	11220208	1
Caelo	Sodium dodecyl sulfate	12153003	1
Caelo	Sodium dodecyl sulfate	12153004	1
Caelo	Sodium dodecyl sulfate	12153019	1
Caelo	Cocoa butter	515A-03176	1
Gutenberg-Apotheke	Cocoa butter	13292007	1
Caelo	Cocoa butter	13292015	1
Caelo	Cocoa butter	13292019	1
Caelo	Cocoa butter	14304703	1
Caelo	Cocoa butter	16049201	1
Caelo	Cocoa butter	11079607	2
Caesar & Loretz GmbH	Cocoa butter	12270210	2
Caesar & Lorenz	Cocoa butter	13140404	1
Caelo	Paraffin, microcrystalline	13274308	1
Caelo	Paraffin, microcrystalline	14307108	2
Caelo	Paraffin, microcrystalline	15412801	2
Caelo	Paraffin, microcrystalline	17137502	1
Caelo	Paraffin, microcrystalline	3042012M1	1
Caelo	Paraffin, microcrystalline	7111201	1
Caelo	Paraffin, microcrystalline	7111202	1
Caelo	Paraffin, microcrystalline	12065104	1
Caelo	Paraffin, microcrystalline	12095101	1
Noweda	Paraffin, microcrystalline	12266304	1
Caelo	Paraffin, microcrystalline	12266304	1
Caelo	Paraffin, microcrystalline	12355001	1
Caelo	Paraffin, microcrystalline	13274301	1
Phönix	Paraffin, microcrystalline	13274301	1
Caelo	Paraffin, microcrystalline	30101202	1
Caelo	Paraffin, hard	14286503	1
Caelo	Paraffin, hard	15295410	1

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Supplier	Substance	Batch	Spectra
Caelo	Paraffin, hard	1136206	1
Caelo	Hard fat in pastilles	20071501	1
Caelo	Hard fat in pastilles	10356001	1
Fagron	Hard fat in pastilles	12I04-N11	1
Caelo	Hard fat in pastilles	13243416	1
Fagron	Hard fat in pastilles	13F26-N02	1
Phytocomm	Hard fat in pastilles	209314	2
Klenk	Wax, yellow	280A120627	9
Alliance	Wax, yellow	280A130115	1
Klenk	Wax, yellow	280A110110	1
Noweda	Wax, yellow	280A120627	2
Klenk	Wax, yellow	280-A120627	1
Alliance Health 14.04.2...	Wax, yellow	280A130115	1
Klenk	Wax, yellow	280A13011A	1
Klenk	Wax, yellow	282A120627	1
Klenk	Wax, yellow	282A140306	1
Klenk	Wax, yellow	290A140903	5
Klenk	Wax, yellow	290A081210	1
Klenk	Wax, yellow	290A150716	3
Klenk	Wax, yellow	290A110803	1
Alliance Healthcare	Wax, yellow	290A120627	1
Caelo	Wax, yellow	4031403	1
Caelo	Wax, yellow	6111407	1
Caelo	Wax, yellow	10121302	1
Finze	Wax, yellow	10145002	1
Caelo	Wax, yellow	10145019	1
Caelo	Wax, yellow	10364810	1
Caelo	Wax, yellow	10364814	1
Caelo	Wax, yellow	10364829	1
Caelo	Wax, yellow	10364837	1
Caelo	Wax, yellow	110124	1
Kehr	Wax, yellow	10F03-N09	1
Caelo	Wax, yellow	11017314	1
Caelo	Wax, yellow	11017315	1
Caelo	Wax, yellow	11101207	1
Caesar & Loretz GmbH, 4...	Wax, yellow	11285008	1
Caelo	Wax, yellow	11285008	1
Caelo	Wax, yellow	11285010	1
Caelo	Wax, yellow	11285014	2
Noweda	Wax, yellow	11308305	1
Caelo	Wax, yellow	11285015	1
Caelo	Wax, yellow	11308305	1
Caelo	Wax, yellow	11308311	2
Sanacorp	Wax, yellow		2
Caelo	Wax, yellow	12/AKD7	1
Euro OTC	Wax, yellow	1201012-01	1
Caelo	Wax, yellow	12041303	1
Gehe	Wax, yellow	12079412	1
Caelo	Wax, yellow	12091404	1
Caelo	Wax, yellow	12124801	7
Noweda	Wax, yellow	12124801	1
Caelo	Wax, yellow	12124802	2
Caelo	Wax, yellow	121248024-2015	1
Caelo	Wax, yellow	12124805	6
Großhandel	Wax, yellow	12124805	2
Caelo	Wax, yellow	12124806	2
Caelo	Wax, yellow	12124807	3
Caelo	Wax, yellow	12124811	1
Caelo	Wax, yellow	12124812	8
Caelo	Wax, yellow	12124814	2

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Supplier	Substance	Batch	Spectra
Caelo	Wax, yellow	12124816	1
Caelo	Wax, yellow	12124817	3
Caelo	Wax, yellow	1214812	1
Caelo	Wax, yellow	12257002	3
Caelo	Wax, yellow	12257004	2
Sanacorp	Wax, yellow	12257009	1
Caelo	Wax, yellow	12257012	4
Hirsch	Wax, yellow	12257012	1
Caelo	Wax, yellow	12257022	3
Caelo	Wax, yellow	12330116	1
Caelo	Wax, yellow	12367020	1
Phönix	Wax, yellow	12367901	1
Caesar & Loretz GmbH, 4...	Wax, yellow	12367901	1
Phönix	Wax, yellow	12367904	1
gehe 16.08.13	Wax, yellow	12367904	1
Caelo	Wax, yellow	12367910	10
AHD , 04.09.13	Wax, yellow	12367910	1
Gehe	Wax, yellow	12367910	1
Caesar & Loretz GmbH, 4...	Wax, yellow	12367910	1
Sanacorp	Wax, yellow	12367910	1
Caesar & Loretz GmbH	Wax, yellow	12367910	1
Caelo	Wax, yellow	12367911	2
Caelo	Wax, yellow	12367912	5
AHD,18.10.13	Wax, yellow	12367915	1
Caelo	Wax, yellow	12367915	10
Phönix	Wax, yellow	12367915	1
Caelo	Wax, yellow	12367921	1
Fagron	Wax, yellow	12K20B05287421	1
Caelo	Wax, yellow	12K20B05287421	1
PHOENIX 24.07.2014	Wax, yellow	13001206	1
Caelo	Wax, yellow	13031201	6
Phönix	Wax, yellow	13031206	1
Caelo	Wax, yellow	13031220	3
Caesar/Noweda	Wax, yellow	13031220	1
Caelo	Wax, yellow	13031221	1
Caelo	Wax, yellow	13031222	4
Caelo	Wax, yellow	13031231	8
Ichthyol	Wax, yellow	13031239	1
Caelo	Wax, yellow	13031239	11
Caelo	Wax, yellow	13031240	1
Caelo	Wax, yellow	13051401	1
Caelo	Wax, yellow	13061503	1
Caelo	Wax, yellow	13335502	9
Großhandel	Wax, yellow	13335502	1
Sanacorp	Wax, yellow	13335502	1
Cealo/Gehe	Wax, yellow	13335502	1
GEHE	Wax, yellow	13335502	1
Caelo	Wax, yellow	13335503	8
Caelo	Wax, yellow	13335507	4
Caelo	Wax, yellow	13335505	1
Caelo	Wax, yellow	13335508	1
Caelo	Wax, yellow	13335509	4
Klenk	Wax, yellow	13335513	1
Caelo	Wax, yellow	13335513	4
Caelo	Wax, yellow	13335516	4
Caelo	Wax, yellow	13335518	2
Caelo	Wax, yellow	1335503	1
Caelo	Wax, yellow	13378603	1
Caelo	Wax, yellow	13378619	16
Sanacorp	Wax, yellow	13378619	1

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Supplier	Substance	Batch	Spectra
Caelo	Wax, yellow	13378630	2
Caelo	Wax, yellow	13378634	7
Caelo	Wax, yellow	13378636	1
Caelo	Wax, yellow	13378639	3
Caelo	Wax, yellow	13378640	2
Fagron	Wax, yellow	13804-N04	1
Fagron	Wax, yellow	13B04-N04	2
Fagron	Wax, yellow	13l02-B01	1
Fagron	Wax, yellow	13L02-B01-291452	1
Fagron	Wax, yellow	13L02-B01-294113	2
Fagron	Wax, yellow	13L02-B01-294114	1
Euro OTC	Wax, yellow	1407013-01	1
Euroo	Wax, yellow	1407013-01	1
Caelo	Wax, yellow	1418915	1
Caelo	Wax, yellow	14189901	2
Caelo	Wax, yellow	14189902	2
Caelo	Wax, yellow	14189905	1
Caelo	Wax, yellow	14189906	1
Caelo	Wax, yellow	14189907	3
Caelo	Wax, yellow	14189908	1
Caelo	Wax, yellow	14189909	5
Caelo	Wax, yellow	14189913	4
Caelo	Wax, yellow	14189914	4
Caelo	Wax, yellow	14189917	2
Caelo	Wax, yellow	14189919	1
Fagron	Wax, yellow	14189920	1
Caelo	Wax, yellow	14336605	2
Caelo	Wax, yellow	14336608	3
Caelo	Wax, yellow	14336609	2
Caelo	Wax, yellow	14336616	7
Fagron	Wax, yellow	14336616	1
Caelo	Wax, yellow	14336618	1
Caelo	Wax, yellow	14336620	3
Caelo	Wax, yellow	1436616	1
Caelo	Wax, yellow	1436620	1
Anzag	Wax, yellow	1462	1
Caelo	Wax, yellow	14G07-B04-300495	1
Fagron	Wax, yellow	14G07-B04-300495	2
Caelo	Wax, yellow	15022902	4
Caelo	Wax, yellow	15022903	1
Caelo	Wax, yellow	15022904	2
Caelo	Wax, yellow	15022907	1
Caelo	Wax, yellow	15022908	7
Noweda	Wax, yellow	150230004	1
Noweda	Wax, yellow	15023002	1
Caelo	Wax, yellow	15023003	3
Caelo	Wax, yellow	15023004	8
Caelo	Wax, yellow	15041301	1
Phoenix goettingen 08.05	Wax, yellow	15098901	1
Caelo	Wax, yellow	15098902	2
Caelo	Wax, yellow	152920004	1
Caelo	Wax, yellow	15292004	10
Caelo	Wax, yellow	15292005	3
Caelo	Wax, yellow	15292007	1
Caelo	Wax, yellow	15292009	1
Caelo	Wax, yellow	15292014	2
Caelo	Wax, yellow	15317601	3
Caelo	Wax, yellow	15292022	1
Caelo	Wax, yellow	15317602	4
Caelo	Wax, yellow	15317603	3

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Supplier	Substance	Batch	Spectra
Caelo	Wax, yellow	15317604	1
Caelo	Wax, yellow	15317607	3
Caelo	Wax, yellow	16038201	8
Caelo	Wax, yellow	16038202	8
phönix	Wax, yellow	16038207	1
Caelo	Wax, yellow	16163109	1
Caelo	Wax, yellow	16163112	1
Caelo	Wax, yellow	17011403	1
Caelo	Wax, yellow	17041402	1
Caelo	Wax, yellow	17121201	1
Caelo	Wax, yellow	17121202	1
Caelo	Wax, yellow	18121201	1
Caelo	Wax, yellow	20031516	1
Caelo	Wax, yellow	20031517	1
Caelo	Wax, yellow	20071503	1
Caelo	Wax, yellow	2179	1
Caelo	Wax, yellow	22071301	1
Caelo	Wax, yellow	26091302	1
Bombastus	Wax, yellow	270682	3
Caelo	Wax, yellow	28011501	1
Bombastus	Wax, yellow	296261	1
Caelo	Wax, yellow	30011407	1
Caelo	Wax, yellow	30101308	1
Klenk	Wax, bleached	280A150528	5
Caelo	Wax, yellow	4910A-01239	1
Klenk	Wax, bleached	280A160311	3
Caelo	Wax, bleached	280A150528	1
Bombastus	Wax, bleached	280A171019	1
Klenk	Wax, bleached	290A150716	1
Caelo	Wax, bleached	1/AKD13	1
Caelo	Wax, bleached	14336621	1
Caelo	Wax, bleached	15292002	1
Caelo	Wax, bleached	15292003	6
Phoenix	Wax, bleached	15292003	1
Caelo	Wax, bleached	15292004	1
Caelo	Wax, bleached	15292005	2
Caelo	Wax, bleached	15292010	1
Caelo	Wax, bleached	15292011	1
Caelo	Wax, bleached	15292014	10
Caelo	Wax, bleached	15292022	2
phönix	Wax, bleached	15292022	1
Caelo	Wax, bleached	16163101	2
Caelo	Wax, bleached	16163105	8
Caelo	Wax, bleached	16163109	4
phönix	Wax, bleached	16163109	1
Caelo	Wax, bleached	16163114	2
Fagron	Wax, bleached	16A28-B10-322948	1
Fagron	Wax, bleached	2155	1
Klenk	Wax, yellow	290A151214	1
Caelo	Wax, yellow	14189915	1
Euro OTC	Wax, yellow	1503013-01	1
Caelo	Wax, yellow	15098901	1
Phönix	Wax, yellow	15317609	1
cae	Wax, yellow	15317608	1
Caelo	Wax, yellow	15317609	7
Caelo	Wax, yellow	15317610	3
Caesar & Loretz	Wax, yellow	15317613	1
Caelo	Wax, yellow	1595	1
Caesar & Loretz	Wax, yellow	16038201	1
Caelo	Wax, yellow	16038207	1

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Supplier	Substance	Batch	Spectra
Caesar&Loretz GmbH	Wax, yellow	16038210	1
Caelo	Wax, yellow	17011604	2
Caelo	Wax, yellow	17011605	1
Caelo	Wax, yellow	17011607	2
Caelo	Wax, yellow	17011609	1

- 75 456 spectra from 463 *Apo-Ident* customers from a total of 24 986 batches from a further 692 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Waxes / Fats* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Waxes / Fats* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	1207	0	71 226
Type B	0	1490	83	160 500
Type C	0	1640	63	75 456

The substance/substance group *Waxes / Fats* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9887 %)	100.0000 % (> 99.5029 %)
Type B	100.0000 % (> 99.9928 %)	94.7235 % (> 94.5327 %)
Type C	100.0000 % (> 99.8849 %)	96.3006 % (> 96.1245 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

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Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20747	22767	9.64	36.38
20865	20865	0.00	36.20
20986	20986	0.00	37.63
21067	22479	6.00	44.17
21433	22767	7.19	33.15
21482	23067	13.32	56.23
21483	21483	0.00	30.21
21682	21682	0.00	36.08
21731	22349	1.91	39.45
21766	22330	2.75	36.06
21875	21984	4.22	34.35
21880	21880	0.00	44.51
21984	21984	0.00	35.89
22244	22767	9.12	36.27
22245	22767	5.38	33.13
22325	21984	2.63	34.50
22330	22330	0.00	36.88
22338	21880	4.94	45.05
22348	23067	3.99	57.64
22349	22349	0.00	39.65
22352	23278	4.63	37.34
22479	22479	0.00	44.03
22486	22486	0.00	32.57
22767	22767	0.00	30.98
22956	22767	12.32	34.40
23067	23067	0.00	56.88
23242	23278	8.34	38.16
23278	23278	0.00	35.59
23565	22479	19.82	46.05
23601	21880	1.92	43.24
23707	23067	3.43	59.68

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Wool alcohols**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20495-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Wool alcohols; Alcoholes adipis lanae; Alcoholes lanae

Special notes

When selecting the *Wool alcohols* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Wool alcohols*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Wool alcohols	13380601	21520	40	1412037
Caelo	Wool alcohols	153703	22328	40	20151111*
Caelo	Wool alcohols	153703	22329	40	20151111*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Wool alcohols*. These samples are listed above in the section *calibration samples*. The reference samples originate from 2 different batches.

- 72 313 spectra from a total of 1580 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 160 spectra from 5 reference samples of the substance/substance group *Wool alcohols*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Wool alcohols	11214708	20495	40
Caelo	Wool alcohols	153703	22328†	20
Caelo	Wool alcohols	153703	22329†	20
Caelo	Wool alcohols	163530	23098	40
Caelo	Wool alcohols	173160	23972	40

- 161 913 spectra from a total of 3495 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B*

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 14 spectra from 10 *Apo-Ident* customers from 11 batches from the substance/substance group *Wool alcohols*.

- These include spectra of independent samples from 10 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Wool alcohols	13071502	1
Cealo/ Noweda	Wool alcohols	13380601	1
Caelo	Wool alcohols	13226408	1
Caelo	Wool alcohols	13380601	1
Caelo	Wool alcohols	15304502	1
Caelo	Wool alcohols	17169701	1
Caelo	Wool alcohols	15304505	1
Caelo	Wool alcohols	23101408	1
Caelo	Wool alcohols	11011401	1
Caelo	Wool alcohols	12340505	1
Caelo	Wool alcohols	13083906	3
Caelo	Wool alcohols	13083912	1

- 77 145 spectra from 463 *Apo-Ident* customers from a total of 25 536 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Wool alcohols* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Wool alcohols* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	160	0	161 913
Type C	0	14	0	77 145

The substance/substance group *Wool alcohols* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 96.2500 %)
Type C	100.0000 % (> 99.8850 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21520	21520	0.00	53.98
22328	22328	0.00	39.05
22329	22329	0.00	39.37

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Xylitol**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20994-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Xylitol; Xylitolum

Special notes

When selecting the *Xylitol* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Xylitol*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Xylitol	14G04-B04-298356	21754	40	AR-15-FG-008046-01
Caelo	Xylitol	14068206	21755	40	20140317
Caelo	Xylitol	15135405	22248	40	20150417
Fagron	Xylitol	14G04-B04-303524	22254	40	20140919

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 4 reference samples from the substance/substance group *Xylitol*. These samples are listed above in the section *calibration samples*. The reference samples originate from 4 different batches.

- 72 273 spectra from a total of 1578 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 360 spectra from 11 reference samples of the substance/substance group *Xylitol*.

- These include spectra of independent samples from 6 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Dr. Pfeifer	Xylitol	zu erfassen	20633	40
Dr. Pfeifer	Xylitol	10BIZU130702	20994	40
Dr. Pfeifer	Xylitol	130610	21099	40
Fagron	Xylitol	14G04-B04-298356	21754†	20
Caelo	Xylitol	14068206	21755†	20
Caelo	Xylitol	15135405	22248†	20
Fagron	Xylitol	14G04-B04-303524	22254†	20
Caelo	Xylitol	15388101	22578	40
Caelo	Xylitol	15135405	22579	40
Caelo	Xylitol	163174	23061	40
Caelo	Xylitol	181133	24041	40

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 713 spectra from a total of 3490 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 23 spectra from 13 *Apo-Ident* customers from 18 batches from the substance/substance group *Xylitol*.

- These include spectra of independent samples from 15 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Xylitol	12240612	1
Caelo	Xylitol	13230305	1
Caelo	Xylitol	13230302	2
Caelo	Xylitol	13230315	1
Fagron	Xylitol	13H28N10	1
Fagron	Xylitol	13H28-N10	2
Caelo	Xylitol	14061401	1
Caelo	Xylitol	14068206	1
Caelo	Xylitol	14G04-B04-298356	2
Fagron	Xylitol	14G04-B04-303524	2
Caelo	Xylitol	5112I-02787	1
Caelo	Xylitol	12039003	1
Fagron	Xylitol	13/23-N06	1
Caelo	Xylitol	13230309	1
Caelo	Xylitol	15135401	1
Caelo	Xylitol	15388104	2
Caelo	Xylitol	16317401	1
Caelo	Xylitol	3314M-02787	1

- 77 136 spectra from 463 *Apo-Ident* customers from a total of 25 529 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Xylitol* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Xylitol* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	72 273
Type B	0	360	0	161 713
Type C	0	23	0	77 136

The substance/substance group *Xylitol* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 98.3333 %)
Type C	100.0000 % (> 99.8850 %)	100.0000 % (> 73.9130 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21754	21754	0.00	33.89
21755	21754	6.62	38.17
22248	21754	7.14	38.61
22254	21754	2.02	33.53

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Xylometazoline hydrochloride**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20025-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Xylometazoline hydrochloride; Xylometazolini hydrochloridum; Xylometazolinum hydrochloricum

Special notes

When selecting the *Xylometazoline hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Xylometazoline hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Xylometazoline h…	13344901	21516	40	1501655
Fagron	Xylometazoline h…	13I18-B03-295481	21722	40	AR-15-FG-007785-01
Fagron	Xylometazoline h…	14K19-B05-305006	21927	40	20141128
Caelo	Xylometazoline h…	16074211	23246	40	20160318
Fagron	Xylometazoline h…	14K19-B05-305006	21927SI	40	20141128

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 200 spectra of 5 reference samples from the substance/substance group *Xylometazoline hydrochloride*. These samples are listed above in the section *calibration samples*. The reference samples originate from 4 different batches.

- 72 233 spectra from a total of 1578 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 520 spectra from 14 reference samples of the substance/substance group *Xylometazoline hydrochloride*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Xylometazoline hydrochloride	91206209	20025	40
Caelo	Xylometazoline hydrochloride	13344901	21516†	20
Caelo	Xylometazoline hydrochloride	13344901	21517	60
Fagron	Xylometazoline hydrochloride	13I18-B03-295481	21722†	20
Fagron	Xylometazoline hydrochloride	14K19-B05-305006	21927†	20
Caelo	Xylometazoline hydrochloride	170739	23314	40
Caelo	Xylometazoline hydrochloride	170739	23320	40
Caelo	Xylometazoline hydrochloride	173457	23832	40
Caelo	Xylometazoline hydrochloride	13344901	21517SI	60
Fagron	Xylometazoline hydrochloride	14K19-B05-305006	21927SI†	20
Caelo	Xylometazoline hydrochloride	16074211	23246SI	40
Caelo	Xylometazoline hydrochloride	170739	23314SI	40
Caelo	Xylometazoline hydrochloride	170739	23320SI	40
Caelo	Xylometazoline hydrochloride	173457	23832SI	40

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- 161 553 spectra from a total of 3492 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 104 spectra from 66 *Apo-Ident* customers from 38 batches from the substance/substance group *Xylometazoline hydrochloride*.

- These include spectra of independent samples from 37 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Xylometazoline hydrochloride	2031502	1
Caelo	Xylometazoline hydrochloride	10118821	3
Caelo	Xylometazoline hydrochloride	12287203	10
Caelo	Xylometazoline hydrochloride	12287210	8
Caelo	Xylometazoline hydrochloride	12287212	2
Caelo	Xylometazoline hydrochloride	13171202	11
Celoa vdL	Xylometazoline hydrochloride	13171202	1
Caelo	Xylometazoline hydrochloride	13171203	2
Caelo	Xylometazoline hydrochloride	13171205	2
Fagron	Xylometazoline hydrochloride	1318-B03-295479	1
Caelo	Xylometazoline hydrochloride	13344901	1
Caelo	Xylometazoline hydrochloride	13344908	2
Fagron	Xylometazoline hydrochloride	13I09-N02	1
Caelo	Xylometazoline hydrochloride	15037906	2
Sanacorp	Xylometazoline hydrochloride	15037906	1
Caelo	Xylometazoline hydrochloride	15037907	2
Anzag	Xylometazoline hydrochloride	15037907	2
Caelo	Xylometazoline hydrochloride	15037910	4
Caelo	Xylometazoline hydrochloride	15292803	5
Caelo	Xylometazoline hydrochloride	15037912	3
Caelo	Xylometazoline hydrochloride	15292804	8
Caelo	Xylometazoline hydrochloride	15292812	2
Fagron	Xylometazoline hydrochloride	15Jo6-B99-313751	1
Caelo	Xylometazoline hydrochloride	160740209	1
Caelo	Xylometazoline hydrochloride	16074201	2
Caelo	Xylometazoline hydrochloride	16074205	1
Caelo	Xylometazoline hydrochloride	16074216	2
Gehe	Xylometazoline hydrochloride	10118802	1
Caelo	Xylometazoline hydrochloride	9276404	1
Caelo	Xylometazoline hydrochloride	9278404	1
Caelo	Xylometazoline hydrochloride	10118805	1
Noweda	Xylometazoline hydrochloride	12027902	1
Sanacorp	Xylometazoline hydrochloride	12027902	1
Caelo	Xylometazoline hydrochloride	12027906	4
Anzag	Xylometazoline hydrochloride	12027911	1

continued on the next page

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Xylometazoline hydrochloride	1207906	1
Caelo	Xylometazoline hydrochloride	12287201	2
Noweda	Xylometazoline hydrochloride	12287203	1
Caelo	Xylometazoline hydrochloride	12287204	2
Fagron	Xylometazoline hydrochloride	12287210	1
Fagron	Xylometazoline hydrochloride	12G31-N01	1
Caelo	Xylometazoline hydrochloride	12287213	1
Fagron	Xylometazoline hydrochloride	13171203	1
Fagron	Xylometazoline hydrochloride	13E06-N11	1
Caelo	Xylometazoline hydrochloride	24111202	1

- 77 055 spectra from 463 *Apo-Ident* customers from a total of 25 509 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Xylometazoline hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Xylometazoline hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	200	0	72 233
Type B	0	502	18	161 553
Type C	0	101	3	77 055

The substance/substance group *Xylometazoline hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9928 %)	96.5385 % (> 95.9615 %)
Type C	100.0000 % (> 99.8850 %)	97.1154 % (> 94.2308 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

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Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21516	21516	0.00	40.96
21722	21722	0.00	50.30
21927	21722	6.01	50.32
23246	21722	8.28	50.70

VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Xylose**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20517-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Xylose; Xylosum

Special notes

When selecting the *Xylose* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Xylose*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Xylose	14218902	21606	40	AR-14-FG-013086-01
Fagron	Xylose	13A31-B40-292395	21763	40	20140407
Caelo	Xylose	17160902	23413	40	20170704

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Xylose*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 280 spectra from 8 reference samples of the substance/substance group *Xylose*.

- These include spectra of independent samples from 6 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Xylose	11L09-N11	20517	40
Caelo	Xylose	13133402	20868	40
Caelo	Xylose	14218902	21606†	20
Fagron	Xylose	13A31-B40-292395	21763†	20
Caelo	Xylose	162064	22758	40
Fagron	Xylose	16A25-B05-328261	23524	40
Caelo	Xylose	171609	23656	40
Caelo	Xylose	173188	23849	40

- 161 793 spectra from a total of 3491 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B*

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 39 spectra from 12 *Apo-Ident* customers from 27 batches from the substance/substance group *Xylose*.

- These include spectra of independent samples from 27 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Caelo	Xylose	5031501	1
Fagron	Xylose	5031510	1
Fagron	Xylose	80414PJK01	1
Eigenherstellung	Xylose	80414HJK01	1
Gehe	Xylose	1000110821	1
Fagron	Xylose	10121401	1
Gehe	Xylose	11J06-N01	1
Caelo	Xylose	11031501	1
Caelo	Xylose	12120101	1
Caelo	Xylose	12120102	3
Caelo	Xylose	13133404	2
Caelo	Xylose	13133414	3
Caelo	Xylose	13133410	1
Phoenix Goettin	Xylose	13133422	1
Fagron	Xylose	13133415	1
Phoenix 20.06.2014	Xylose	13A31-B04-292396	1
Caelo	Xylose	14218903	1
Fagron	Xylose	14E-B03300658	1
Ebert & Jacobi 12.07...	Xylose	16002301	2
Caelo	Xylose	16002301	1
Caelo	Xylose	16002302	2
Caelo	Xylose	16002308	1
Caelo	Xylose	16002309	1
Caelo	Xylose	16206405	1
Euro OTC	Xylose		1
Falcento	Xylose	2013051801	1
Fagron	Xylose	28111405	1
Gehe	Xylose	xrf12020201	5

- 77 120 spectra from 463 *Apo-Ident* customers from a total of 25 520 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Xylose* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Xylose* and it was evaluated how

many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	280	0	161 793
Type C	0	37	2	77 120

The substance/substance group *Xylose* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 97.8571 %)
Type C	100.0000 % (> 99.8850 %)	94.8718 % (> 87.1795 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21606	21606	0.00	60.29
21763	21606	10.33	59.92
23413	21606	11.40	59.83

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Zinc acetate dihydrate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20398-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Zinc acetate dihydrate; Zinci acetas dihydricus; Zincum aceticum purum

Special notes

When selecting the *Zinc acetate dihydrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Zinc acetate dihydrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Zinc acetate dih…	15383301	22728	40	20151127
Caelo	Zinc acetate dih…	153833	23030	40	20151127*
Caelo	Zinc acetate dih…	170204	23031	40	20170126*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Zinc acetate dihydrate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 200 spectra from 5 reference samples of the substance/substance group *Zinc acetate dihydrate*.

- These include spectra of independent samples from 4 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Zinc acetate dihydrate	10302505	20398	40
Caelo	Zinc acetate dihydrate	11354901	20492	40
Caelo	Zinc acetate dihydrate	11354902	20504	40
Caelo	Zinc acetate dihydrate	17020404	23514	40
Caelo	Zinc acetate dihydrate	170204	23637	40

- 161 873 spectra from a total of 3494 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 18 spectra from 16 *Apo-Ident* customers from 12 batches from the substance/substance group *Zinc acetate dihydrate*.

- These include spectra of independent samples from 11 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fiebig	Zinc acetate dihydrate	211172/2	1
Caelo	Zinc acetate dihydrate	12316405	1
Caelo	Zinc acetate dihydrate	12316404	2
Caelo	Zinc acetate dihydrate	15160801	1
Caelo	Zinc acetate dihydrate	15160804	2
phönix	Zinc acetate dihydrate	15383301	1
Caelo	Zinc acetate dihydrate	17020403	2
Caelo	Zinc acetate dihydrate	12134801	2
Gehe	Zinc acetate dihydrate	12134803	1
Caelo	Zinc acetate dihydrate	12134803	1
Caelo	Zinc acetate dihydrate	12316401	1
Caelo	Zinc acetate dihydrate	12316403	2
Caelo	Zinc acetate dihydrate	71359347	1

- 77 141 spectra from 463 *Apo-Ident* customers from a total of 25 535 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Zinc acetate dihydrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Zinc acetate dihydrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	157	43	161 873
Type C	0	7	11	77 141

The substance/substance group *Zinc acetate dihydrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	78.5000 % (> 77.0000 %)
Type C	100.0000 % (> 99.8850 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
22728	23030	2.87	48.44
23030	23030	0.00	48.67
23031	23031	0.00	50.72

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**Zinc gluconate**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20379-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Zinc gluconate; Zinci gluconas; Zincum gluconicum

Special notes

When selecting the *Zinc gluconate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *Zinc gluconate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Zinc gluconate	1407033-02	21709	40	20140902
Euro OTC	Zinc gluconate	1508007	21882	40	20150827*
Euro OTC	Zinc gluconate	1603035	22513	40	20160427*
Caelo	Zinc gluconate	170165	23034	40	20170125*
Caelo	Zinc gluconate	170951	23292	40	20170518*

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 200 spectra of 5 reference samples from the substance/substance group *Zinc gluconate*. These samples are listed above in the section *calibration samples*. The reference samples originate from 5 different batches.

- 72 233 spectra from a total of 1577 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 280 spectra from 8 reference samples of the substance/substance group *Zinc gluconate*.

- These include spectra of independent samples from 6 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Zinc gluconate	1111002-01	20379	40
Euro OTC	Zinc gluconate	1407033-02	21709†	20
Euro OTC	Zinc gluconate	1508007	21882†	20
Caelo	Zinc gluconate	161788	22619	40
Euro OTC	Zinc gluconate	1606018	22700	40
Euro OTC	Zinc gluconate	1701017	22994	40
Euro OTC	Zinc gluconate	1706009	23544	40
Euro OTC	Zinc gluconate	1711004	23730	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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- 161 793 spectra from a total of 3491 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 7 spectra from 5 *Apo-Ident* customers from 6 batches from the substance/substance group *Zinc gluconate*.

- These include spectra of independent samples from 6 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Euro OTC	Zinc gluconate	1312010-01	1
Fagron	Zinc gluconate	14J30-B06-300520	1
Euro OTC	Zinc gluconate	1405011-01	1
Caelo	Zinc gluconate	17016502	2
Caelo	Zinc gluconate	16178801	1
Caelo	Zinc gluconate	17095103	1

- 77 152 spectra from 463 *Apo-Ident* customers from a total of 25 541 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *Zinc gluconate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Zinc gluconate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	200	0	72 233
Type B	0	280	0	161 793
Type C	0	7	0	77 152

The substance/substance group *Zinc gluconate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 97.8571 %)
Type C	100.0000 % (> 99.8851 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21709	23292	3.53	18.74
21882	21882	0.00	16.21
22513	22513	0.00	14.51
23034	23034	0.00	18.51
23292	23292	0.00	19.61

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**(R,S)-epinephrine hydrochloride**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20929-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

(R,S)-epinephrine hydrochloride; (R,S)-adrenaline hydrochloride; Adrenalinum racemici hydrochloridum

Special notes

When selecting the *(R,S)-epinephrine hydrochloride* substance/substance group, the following information is displayed to the user:

- Advice for the identification of (R,S)-epinephrinhydrochoride: According to the German BfArM, ephedrine and its salts are considered as critical pharmaceuticals in compliance to German § 5 AMG. Critical pharmaceuticals must not be placed on the market or be applied to humans.

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *(R,S)-epinephrine hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	(R,S)-epinephrin...	12H08-N03	20929	40	no certificate available
Fagron	(R,S)-epinephrin...	14A22-B05-291560	21567	40	no certificate available

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 80 spectra of 2 reference samples from the substance/substance group *(R,S)-epinephrine - hydrochloride*. These samples are listed above in the section *calibration samples*. The reference samples originate from 2 different batches.

- 72 353 spectra from a total of 1580 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 60 spectra from 2 reference samples of the substance/substance group *(R,S)-epinephrine hydrochloride*.

- These include spectra of independent samples from 1 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	(R,S)-epinephrine hydrochlor…	14A22-B05-291560	21567†	20
Fagron	(R,S)-epinephrine hydrochlor…	16H23-B98-325052	22842	40

- 162 013 spectra from a total of 3497 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 3 spectra from 3 *Apo-Ident* customers from 3 batches from the substance/substance group *(R,S)-epinephrine hydrochloride*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	(R,S)-epinephrine hydrochlor…	14A22-B05	1
Fagron	(R,S)-epinephrine hydrochlor…	2021503	1
Fagron	(R,S)-epinephrine hydrochlor…	10022015E	1

- 77 156 spectra from 463 *Apo-Ident* customers from a total of 25 544 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *(R,S)-epinephrine hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *(R,S)-epinephrine hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	72 353
Type B	0	60	0	162 013
Type C	0	3	0	77 156

The substance/substance group *(R,S)-epinephrine hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 90.0000 %)
Type C	100.0000 % (> 99.8854 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20929	20929	0.00	62.04
21567	21567	0.00	63.44

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**3.4-diaminopyridine**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20317-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

3.4-diaminopyridine; 3,4-Diaminopyridinum; Amifampridinum

Special notes

When selecting the *3.4-diaminopyridine* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *3.4-diaminopyridine*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	3.4-diaminopyrid…	13F05-N01	20901	40	20130606
Inresa	3.4-diaminopyrid…	0631350001	21781	40	8899
Fagron	3.4-diaminopyrid…	16A22-B04-317264	22321	40	20160204
Inresa	3.4-diaminopyrid…	33-15-IV-56P2749B	22848	40	20160822

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 4 reference samples from the substance/substance group *3.4-diaminopyridine*. These samples are listed above in the section *calibration samples*. The reference samples originate from 4 different batches.

- 72 273 spectra from a total of 1578 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 201 spectra from 7 reference samples of the substance/substance group *3.4-diaminopyridine*.

- These include spectra of independent samples from 3 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	3.4-diaminopyridine	10J14-N21	20317	40
Fagron	3.4-diaminopyridine	10J14-N21	20526	40
Fagron	3.4-diaminopyridine	13F05-N01	20901†	1
Inresa	3.4-diaminopyridine	0631350001	21781†	20
Fagron	3.4-diaminopyridine	16A22-B04-317264	22321†	20
Inresa	3.4-diaminopyridine	33-16-I-77P3018/13072017	23723	40
Fagron	3.4-diaminopyridine	17J11-B01-340962	23766	40

- 161 872 spectra from a total of 3493 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the

†These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

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substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 51 spectra from 10 *Apo-Ident* customers from 27 batches from the substance/substance group *3.4-diaminopyridine*.

- These include spectra of independent samples from 26 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
inresa	3.4-diaminopyridine	58010001	2
	3.4-diaminopyridine	580710001	8
Inresa	3.4-diaminopyridine	580710001	4
inresa	3.4-diaminopyridine	580710001	2
inresa	3.4-diaminopyridine	58710001	2
Inresa	3.4-diaminopyridine	631350001	2
inresa	3.4-diaminopyridine	631350001	1
Fagron	3.4-diaminopyridine	15B20-B02	3
Inresa	3.4-diaminopyridine	63150001	1
Inresa	3.4-diaminopyridine	33-15-IV-56P2749B/22	1
Inresa	3.4-diaminopyridine	33-15-IV-56P2749	2
Inresa	3.4-diaminopyridine	33-16-I-77P3018/1307	1
Inresa	3.4-diaminopyridine	508670001	1
Fagron	3.4-diaminopyridine	11/14-N03	1
Fagron	3.4-diaminopyridine	11K07-N02	1
Gehe	3.4-diaminopyridine	13F07-N07	1
Caelo	3.4-diaminopyridine	13f05-n01	1
Fagron	3.4-diaminopyridine	13F07-N07	1
Fagron	3.4-diaminopyridine	13K14-M03	1
Fagron	3.4-diaminopyridine	13L12-M06	2
Fagron	3.4-diaminopyridine	13L12-M03	1
Fagron	3.4-diaminopyridine	14H11-B06	3
Fagron	3.4-diaminopyridine	14H11-B06-298447	2
Fagron	3.4-diaminopyridine	13K14-M01	1
Inresa	3.4-diaminopyridine	33-15-IV-56P2749B	1
Fagron	3.4-diaminopyridine	16D05-B01-318216	1
Fagron	3.4-diaminopyridine	16D05-B01	1
Fagron	3.4-diaminopyridine	16K15-B03-330546	1
Inresa	3.4-diaminopyridine	33-16-I-77P3018	1
Fagron	3.4-diaminopyridine	13K14-M02	1

- 77 108 spectra from 463 *Apo-Ident* customers from a total of 25 521 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *3.4-diaminopyridine* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *3.4-diaminopyridine* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type ($A/B/C$).

	False positive	True positive	False negative	True negative
Type A	0	160	0	72 273
Type B	0	161	40	161 872
Type C	0	45	6	77 108

The substance/substance group *3.4-diaminopyridine* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9928 %)	80.0995 % (> 78.6070 %)
Type C	100.0000 % (> 99.8850 %)	88.2353 % (> 82.3529 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20901	21781	7.50	39.11
21781	21781	0.00	38.86
22321	21781	4.59	38.87
22848	21781	3.58	38.84

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VALIDATION REPORT

IdentModul 1.3-2018-04

Validated substance/substance group	**5-aminolevulinic acid hydrochloride**
Substance class	APIs & excipients, solid
Report date	18/07/2018
Report number	20371-2018-07-18
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

5-aminolevulinic acid hydrochloride; Acidi aminolevulinici hydrochloridum; Acidum aminolaevulinicum hydrochloricum

Special notes

When selecting the *5-aminolevulinic acid hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7	*European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40	*Erfüllung von* Ph. Eur. 2.2.40 *durch* Apo-Ident [4]
AA004	*Erstellung und Validierung eines IdentModul-Updates*
Anhang F	Zusatz zu den Modellen der zweiten Stufe

Validation method

Validation is performed after every change to the chemometric model (also "database") in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.

2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.

3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the chemometric models. The following samples have been obtained from the substance/substance group *5-aminolevulinic acid hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	5-aminolevulinic…	13K27-N02	21339	40	20131125
Caelo	5-aminolevulinic…	16357904	23208	40	1707616
Fagron	5-aminolevulinic…	17A12-B07-332960	23403	40	20170131

Validation samples

A total of 311 665 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *5-aminolevulinic acid hydrochloride*. These samples are listed above in the section *calibration samples*. The reference samples originate from 3 different batches.

- 72 313 spectra from a total of 1579 batches from further 365 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra recorded under the control of *HiperScan GmbH* and not used for the generation of the database.

Samples from batches, from which no spectra have been used for the generation of the database are considered as independent samples. The number of batches from which independent samples have delivered *Type B* spectra for the validation is given below and thus represents the number of independent *Type B* samples. Samples from which a number of the spectra has been used for the generation of the database and other spectra have been incorporated into the validation, are marked with a †. The following applies to the remaining unmarked samples: There was at least one other sample from the same batch (other sales containers, other sample ID), of which reference spectra (*Type A*) were used for the generation of the database.

- 160 spectra from 4 reference samples of the substance/substance group *5-aminolevulinic acid hydrochloride*.

- These include spectra of independent samples from 2 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	5-aminolevulinic acid hydroc…	11I30-N01	20371	40
Fagron	5-aminolevulinic acid hydroc…	17A12-B07-332960	23404	40
Caelo	5-aminolevulinic acid hydroc…	16357904	23747	40
Fagron	5-aminolevulinic acid hydroc…	18C16-B05-347714	24099	40

- 161 913 spectra from a total of 3495 batches from further 863 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix B*.

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Type C Spectra from the field, which were not recorded under of the control of *Hiperscan GmbH* and have not been used for the generation of the database. *Hiperscan GmbH* accepts the details provided by the customer regarding the manufacturer and batch number mainly unchecked.

- 43 spectra from 19 *Apo-Ident* customers from 31 batches from the substance/substance group *5-aminolevulinic acid hydrochloride*.

- These include spectra of independent samples from 30 batches, of which no spectra have been used for the generation of the database.

Supplier	Substance	Batch	Spectra
Fagron	5-aminolevulinic acid hydroc…	16E17-B08-324961	2
Fagron	5-aminolevulinic acid hydroc…	17F01-B05-338204	1
Fagron	5-aminolevulinic acid hydroc…	16G27-B10	1
Fagron	5-aminolevulinic acid hydroc…	17F01-B06337165	1
Fagron	5-aminolevulinic acid hydroc…	13J29-N03	2
Caelo	5-aminolevulinic acid hydroc…	13017403	1
Caelo	5-aminolevulinic acid hydroc…	14145003	2
Fagron	5-aminolevulinic acid hydroc…	14K04-B01-297971	2
Caelo	5-aminolevulinic acid hydroc…	14145007	1
Caelo	5-aminolevulinic acid hydroc…	14145011	1
Caelo	5-aminolevulinic acid hydroc…	15254803	1
Fagron	5-aminolevulinic acid hydroc…	15J23-B06	1
Fagron	5-aminolevulinic acid hydroc…	16A11-B02-316734	1
Fagron	5-aminolevulinic acid hydroc…	15G01-B06-311678	1
Caelo	5-aminolevulinic acid hydroc…	13K27-N02	1
Fagron	5-aminolevulinic acid hydroc…	15G01-B06	1
Fagron	5-aminolevulinic acid hydroc…	17A12-B07-331745	1
Fagron	5-aminolevulinic acid hydroc…	16I12-B06	1
Fagron	5-aminolevulinic acid hydroc…	7447	1
Caelo	5-aminolevulinic acid hydroc…	11355616	1
Caelo	5-aminolevulinic acid hydroc…	12093205	2
Caelo	5-aminolevulinic acid hydroc…	12093208	1
Fagron	5-aminolevulinic acid hydroc…	12c23-n05	1
Fagron	5-aminolevulinic acid hydroc…	11I30-N01	1
Fagron	5-aminolevulinic acid hydroc…	11K09-N04	1
Fagron	5-aminolevulinic acid hydroc…	12K26-N05	2
Caelo	5-aminolevulinic acid hydroc…	13017402	1
Fagron	5-aminolevulinic acid hydroc…	13C19-N05	3
Fagron	5-aminolevulinic acid hydroc…	13H13-N07	2
Fagron	5-aminolevulinic acid hydroc…	12H20-N01	2
Fagron	5-aminolevulinic acid hydroc…	13K27-N02	2
Fagron	5-aminolevulinic acid hydroc…	16A11-B02-318406	1

- 77 116 spectra from 463 *Apo-Ident* customers from a total of 25 516 batches from a further 700 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this chemometric model, the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix C*.

Validation results

The validation runs checked whether the substance/substance group *5-aminolevulinic acid hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *5-aminolevulinic*

acid hydrochloride and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive*/*negative*) and the validation spectrum type (*A*/*B*/*C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	72 313
Type B	0	160	0	161 913
Type C	0	41	2	77 116

The substance/substance group *5-aminolevulinic acid hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9928 %)	100.0000 % (> 96.2500 %)
Type C	100.0000 % (> 99.8850 %)	95.3488 % (> 88.3721 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21339	23208	22.70	100.17
23208	23208	0.00	84.84
23403	23208	19.63	87.47

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Appendix A: Additional calibration samples (*Type A*)

Substance (spectra also enter the generation of the chemometric model which cannot be identified with this model. This serves the purpose that substances which the model is not supposed to recognise are safely rejected. The spectra of these samples are entered into the validation as *Type A*. They were recorded by *HiperScan GmbH*.

The samples originate from 151 batches. From these, 6029 spectra were recorded. The calibration spectra of substances which can be identified with the model are listed respectively in the section *calibration samples* for the individual substances and do not appear again elsewhere in this list.

Supplier	Substance	Batch	Spectra	Certificate
abcr GmbH	Dimercaptosuccin…	1005874	39	from supplier
abcr GmbH	Glycyrrhizic acid	1222024	40	from supplier
Caelo	Amphetamine sulf…	16153902	40	2017A-03361
Caelo	Amphetamine sulf…	13344603	40	0814J-03361
Caelo	Amphetamine sulf…	13344603	40	0814J-03361
Caelo	Buprenorphine hy…	16143001	40	2017A-07774
Caelo	Buprenorphine hy…	12172908	40	0814I-07774
Caelo	Buprenorphine hy…	12172908	40	0814I-07774
Caelo	Cocaine hydrochl…	17003902	40	1917S-01278
Caelo	Cocaine hydrochl…	15224802	40	1316Q-01278
Caelo	Cocaine hydrochl…	15224802	40	1316Q-01278
Caelo	Cocaine hydrochl…	15224802	40	1316Q-01278
Caelo	Cocaine hydrochl…	15224802	40	1316Q-01278
Caelo	Cocaine hydrochl…	13259305	40	0814J-01278
Caelo	Cocaine hydrochl…	13259305	40	0814J-01278
Caelo	Codeine phosphat…	13071504	40	0814J-01279
Caelo	Codeine phosphat…	15350703	30	1316R-01279
Caelo	Codeine phosphat…	15350703	40	1316R-01279
Caelo	Codeine phosphat…	13071504	40	0814J-01279
Caelo	Dihydrocodeine h…	13267601	40	0914A-03065
Caelo	Dihydrocodeine h…	13267601	40	0914A-03065
Caelo	Dihydrocodeine h…	12142506	40	0914B-03065
Caelo	Dihydrocodeine h…	15295901	40	1316Q-03065
Caelo	Dihydrocodeine h…	12142506	40	0914B-03065
Caelo	Dihydrocodeine h…	15295901	40	1316Q-03065
Caelo	Hydromorphone hy…	13267702	40	0914A-01334
Caelo	Hydromorphone hy…	15393602	40	1516J-01334
Caelo	Hydromorphone hy…	15393602	40	1516J-01334
Caelo	Hydromorphone hy…	13267702	40	0914A-01334
Caelo	Methadone hydroc…	12344818	40	0914E-02949
Caelo	Methadone hydroc…	12344818	40	0914E-02949
Caelo	Methadone hydroc…	15244715	40	1516A-02949
Caelo	Methadone hydroc…	15244715	40	1516A-02949
Caelo	Midazolam hydroc…	15224602	40	1516B-03538
Caelo	Midazolam hydroc…	12215811	40	0914E-03538
Caelo	Midazolam hydroc…	15224602	40	1516B-03538
Caelo	Midazolam hydroc…	12215811	40	0914E-03538
Caelo	Morphine hydroch…	15439404	40	1416R-01879
Caelo	Morphine hydroch…	15439404	40	1416R-01879
Caelo	Morphine hydroch…	13349505	40	0914F-01879
Caelo	Morphine hydroch…	13125207	40	0914E-01879
Caelo	Morphine hydroch…	13125207	40	0914E-01879
Caelo	Morphine hydroch…	13349505	40	0914F-01879
Caelo	Morphine hydroch…	16184605	40	1917S-01879
Caelo	Morphine sulfate	11333103	40	0914E-07776
Caelo	Morphine sulfate	11333103	40	0914E-07776
Caelo	Morphine sulfate	12153212	40	0914F-07776
Caelo	Morphine sulfate	15255703	40	1416Q-07776

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Supplier	Substance	Batch	Spectra	Certificate
Caelo	Morphine sulfate	15255703	40	1416Q-07776
Caelo	Oxycodone hydroc…	12268913	40	1416R-07734
Caelo	Oxycodone hydroc…	12268914	40	1416Q-07734
Caelo	Oxycodone hydroc…	12268908	40	0914E-07734
Caelo	Oxycodone hydroc…	12034515	40	0914F-07734
Caelo	Oxycodone hydroc…	12268914	40	1416Q-07734
Caelo	Oxycodone hydroc…	12268913	40	1416R-07734
Caelo	Oxycodone hydroc…	12034515	40	0914F-07734
Caelo	Oxycodone hydroc…	12268908	40	0914E-07734
Caelo	Phenobarbital	12173202	40	0914E-01040
Caelo	Phenobarbital	12173202	40	0914E-01040
Caelo	Zinc stearate	180628	40	20180322*
Dr. Behr	L-carnitine hydr…	WE11030091	40	from supplier
Dr. Behr	L-carnitine tart…	WE15080050	40	from supplier
Dr. Behr	L-carnitine tart…	WE11060069	40	from supplier
Euro OTC	Griffonia seed e…	1705007	40	20170601*
Euro OTC	Griffonia seed e…	1205027	40	from supplier
Euro OTC	L-carnitine tart…	1302017-01	40	from supplier
Fagron	Amphetamine sulf…	15L01-B05-315291	40	1316Q-03361
Fagron	Amphetamine sulf…	13G08-N11	40	0814K-03361
Fagron	Amphetamine sulf…	15L01-B05-315291	40	1316Q-03361
Fagron	Amphetamine sulf…	13G08-N11	40	0814K-03361
Fagron	Barbital sodium	14K14-B04-303353	40	1516I-07775
Fagron	Barbital sodium	12F27-N02	40	0814I-07775
Fagron	Barbital sodium	14K14-B04-303353	40	1516I-07775
Fagron	Barbital sodium	12F27-N02	40	0814I-07775
Fagron	Cocaine hydrochl…	13I17-N02	40	0814I-01278
Fagron	Cocaine hydrochl…	13I17-N02	40	0814I-01278
Fagron	Codeine phosphat…	13C11-N10	40	0814I-01279
Fagron	Codeine phosphat…	15F09-B02-310520	40	1316Q-01279
Fagron	Codeine phosphat…	13C11-N10	40	0814I-01279
Fagron	Codeine phosphat…	15F09-B02-310520	40	1316Q-01279
Fagron	Codeine phosphat…	16E17-B05-324109	40	2017A-01279
Fagron	Dexamphetamine s…	13I23-N01	40	0814M-03582
Fagron	Dexamphetamine s…	15H06-B04-313862	40	1316Q-03582
Fagron	Dexamphetamine s…	13I23-N01	40	0814M-03582
Fagron	Dexamphetamine s…	15H06-B04-313862	40	1316Q-03582
Fagron	Dexamphetamine s…	16D20-B01-321049	40	2017B-03582
Fagron	Dihydrocodeine h…	13H19-N03	40	0914C-03065
Fagron	Dihydrocodeine h…	15F18-B07-323388	40	2017A-03065
Fagron	Dihydrocodeine h…	14K26-B04-306298	40	1516I-03065
Fagron	Dihydrocodeine h…	13H19-N03	40	0914C-03065
Fagron	Fentanyl citrate	15F18-B01-525098	40	1316R-03686
Fagron	Fentanyl citrate	13G30-N06	40	0814M-07678
Fagron	Fentanyl citrate	13G30-N06	40	0814M-07678
Fagron	Fentanyl citrate	15F18-B01-525098	40	1316R-03686
Fagron	Fentanyl citrate	15F18-B01-525166	40	1316Q-03686
Fagron	Fentanyl citrate	15F18-B01-525166	40	1316Q-03686
Fagron	Hydromorphone hy…	13I25-N05	40	1516I-01334
Fagron	Hydromorphone hy…	13E16-N02	40	0914B-01334
Fagron	Hydromorphone hy…	13E16-N02	40	0914B-01334
Fagron	Hydromorphone hy…	13I25-N05	40	1516I-01334
Fagron	Hydromorphone hy…	15L08-B08-316877	40	1917Q-01334
Fagron	Methadone hydroc…	15E29-B02-313098	40	1516B-02949
Fagron	Methadone hydroc…	13J24-B06	40	0914F-02949
Fagron	Methadone hydroc…	16F24-B02-323183	40	1917Q-02949
Fagron	Methadone hydroc…	13J24-B06	40	0914F-02949
Fagron	Methadone hydroc…	15E29-B02-313098	40	1516B-02949
Fagron	Midazolam	14C12-B31-313222	40	1516A-07393
Fagron	Midazolam	13K05-N01	40	0914E-07393

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Supplier	Substance	Batch	Spectra	Certificate
Fagron	Midazolam	13K05-N01	40	0914E-07393
Fagron	Midazolam	14C12-B31-313222	40	1516A-07393
Fagron	Midazolam hydroc...	13E22-N09	40	0914F-03538
Fagron	Midazolam hydroc...	14L23-B04-300245	40	1516A-03538
Fagron	Midazolam hydroc...	16C14-B12-332469	40	0718E-03538
Fagron	Midazolam hydroc...	14L23-B04-300245	40	1516A-03538
Fagron	Midazolam hydroc...	13E22-N09	40	0914F-03538
Fagron	Midazolam hydroc...	16C14-B12-332469	40	0718E-03538
Fagron	Midazolam hydroc...	15H04-B03-314396	40	1917R-03538
Fagron	Morphine hydroch...	15I09-B08-312694	40	1416Q-01879
Fagron	Morphine hydroch...	13G08-N04	40	0914G-01879
Fagron	Morphine hydroch...	13G08-N04	40	0914G-01879
Fagron	Morphine hydroch...	15I09-B08-312694	40	1416Q-01879
Fagron	Morphine sulfate	13J07-N04	40	0914G-07776
Fagron	Morphine sulfate	13J07-N04	40	0914G-07776
Fagron	Phenobarbital	15G07-B06-311718	40	1416Q-01040
Fagron	Phenobarbital	15G07-B06-311718	40	1416Q-01040
Flora Apothek...	Amygdalin	13121802	40	1405619
Flora Apothek...	Calcium colamine...	14384	40	from supplier
Safic-Alcan	Amygdalin, bitte...	BAE150902	40	from supplier
Safic-Alcan	Amygdalin, bitte...	BAE150902	40	from supplier
Safic-Alcan	Dimercaptosuccin...	20170210	40	from supplier
Th. Geyer	Amphetamine sulf...	67002	40	0814I-03361
Th. Geyer	Amphetamine sulf...	67002	40	0814I-03361
Th. Geyer	Calcium colamine...	33299	40	from supplier
Th. Geyer	Cocaine hydrochl...	60145	40	0814K-01278
Th. Geyer	Cocaine hydrochl...	60145	40	0814K-01278
Th. Geyer	Codeine phosphat...	67038	40	0814K-01279
Th. Geyer	Codeine phosphat...	67038	40	0814K-01279
Th. Geyer	Dihydrocodeine h...	67035	40	0914D-03065
Th. Geyer	Dihydrocodeine h...	067052	40	2017D-03065
Th. Geyer	Dihydrocodeine h...	67035	40	0914D-03065
Th. Geyer	Methadone hydroc...	67033	40	0914G-02949
Th. Geyer	Methadone hydroc...	67047	40	0914H-02949
Th. Geyer	Methadone hydroc...	67033	40	0914G-02949
Th. Geyer	Methadone hydroc...	67047	40	0914H-02949
Th. Geyer	Mg-Ca-K colamine...	46816	40	from supplier
Th. Geyer	Mg-Ca-K colamine...	36985	40	from supplier
Th. Geyer	Morphine hydroch...	67036	40	0914H-01879
Th. Geyer	Morphine hydroch...	67036	40	0914H-01879
Th. Geyer	Phenobarbital	067056	40	2017A-01040
Th. Geyer	Phenobarbital	67045	40	0914F-01040
Th. Geyer	Phenobarbital	67045	40	0914F-01040

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

Appendix B: Additional validation samples (*Type B*)

It is necessary that spectra also enter the validation which cannot be identified with this model. In this manner, it is verified that the model also rejects unknown substances. The spectra for these samples were recorded by *HiperScan GmbH*. They are allocated to the *Type B*. They also include the calibration spectra for other models.

The samples originate from 1625 batches. From these 70 194 spectra were recorded. The spectra recorded on independent samples of substances which can be identified with the model are listed respectively in the section *Type B* for the individual substances and do not appear again elsewhere in this list.

Supplier	Substance	Batch	Spectra	Certificate
abcr GmbH	Amygdalin	1310927	40	not necessary
abcr GmbH	Amygdalin	1310579	40	not necessary
Alfa Aesar	Theobromine, 99%	A11861	44	not available
AppliChem	Papain	1G000215	40	1407433
Audor	Dithranol	zu erfassen	49	AR-12-FG-003000-01
Audor	Fluconazole	APAFLNC0217023F	40	not necessary
Audor	Fluconazole	AP061502911F	40	AR-16-FG-014225-01
Audor	Fluconazole	AP061502911F	60	AR-16-FG-008733-01
Audor	Fluconazole	AP061502911F	60	not necessary
Audor	Fluconazole	AP061502911F	40	not necessary
Audor	Fluconazole	AP061502911F	40	not necessary
Audor	Fluconazole	AP061502911F	40	not necessary
Audor	Nystatin	AP4018717N	40	not necessary
Aurica	Rosemary leaf, cut	521306257	60	not necessary
Auropure Life…	Amygdalin, bitte…	PA02099-160822	30	from supplier
Berco	Maltodextrin	445-11	40	not available
Biogenerics	Dimercaptosuccin…	100805	40	from supplier
Bombastus	Acorus root, nat…	272703	40	not necessary
Bombastus	Bean shells, cut	00263386	40	from supplier
Bombastus	Bitter fennel	289870	60	AR-15-FG-008161-01
Bombastus	Blessed thistle,…	00244795	40	AR-12-FG-007244-01
Bombastus	Coltsfoot leaf, …	00263091	40	not necessary
Bombastus	Coltsfoot leaf, …	00232644	40	from supplier
Bombastus	Coltsfoot leaf, …	00263091	40	not necessary
Bombastus	Kelp, cut	272383	40	1406341
Bombastus	Liquorice root, …	270853	40	not necessary
Bombastus	Maize style, cut	274920	40	not necessary
Bombastus	Marshmallow root…	00267759	40	not necessary
Bombastus	Matricaria flower	270808	40	from supplier
Bombastus	Matricaria flower	268712	40	not necessary
Bombastus	Oak bark, cut	00254077	40	not necessary
Bombastus	Peppermint leaf,…	275295	40	not necessary
Bombastus	Sage leaf, cut	zu erfassen	40	not necessary
Bombastus	Tall golden rod,…	270047	40	not necessary
Bombastus	Thyme, rubbed	zu erfassen	20	not necessary
Bombastus	Valerian root, cut	zu erfassen	20	not necessary
Bombastus	Wild pansy, cut	00262174	50	not necessary
Bombastus	Willow bark, cut	00263841	40	AR-12-FG-008662-01
Bombastus	Yarrow herb, cut	00266775	40	not necessary
Bombastus	Yarrow herb, cut	00263526	40	not necessary
Caelo	Acorus root, nat…	12076404	40	not necessary
Caelo	Acorus root, pee…	12239001	40	not necessary
Caelo	Acorus root, pee…	11054204	80	not necessary
Caelo	Acorus root, pee…	83244289	80	F 2009 001 075
Caelo	Acorus root, pee…	12295902	40	not necessary
Caelo	Acorus root, pee…	10180804	50	from supplier
Caelo	Agarikon	13130602	48	1405003
Caelo	Agarikon	11024502	30	not necessary

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Supplier	Substance	Batch	Spectra	Certificate
Caelo	Agarikon	14190706	60	not necessary
Caelo	Agarikon	14190702	60	not necessary
Caelo	Agnus castus fruit	15318705	60	pending
Caelo	Agnus castus fruit	13193401	40	AR-15-FG-006453-01
Caelo	Agnus castus fruit	12274003	40	1501649
Caelo	Agrimony, cut	11374004	40	not necessary
Caelo	Agrimony, cut	10325505	45	not necessary
Caelo	Agrimony, cut	09300101	40	not necessary
Caelo	Alchemilla alpin…	12147201	40	not necessary
Caelo	Alchemilla, cut	12153306	40	not necessary
Caelo	Alchemilla, cut	81938349	70	F 2009 001 043
Caelo	Allspice, powder…	12042703	40	not necessary
Caelo	Almonds, bitter,…	13220401	40	1406296
Caelo	Aloes, cape, cut	11048808	40	1404398
Caelo	Aloes, cape, cut	14087106	60	pending
Caelo	Aloes, cape, cut	11048808	40	pending
Caelo	Aloes, cape, pow…	11132115	39	not necessary
Caelo	Aloes, cape, pow…	12183008	40	not necessary
Caelo	Aloes, cape, pow…	10237705	50	not necessary
Caelo	Aloes, cape, pow…	11132115	30	1404400
Caelo	Aloes, cape, pow…	11132107	40	not necessary
Caelo	Aloes, cape, pow…	09286307	40	not necessary
Caelo	Aluminium chlori…	10026113	40	not necessary
Caelo	Aluminium oxide,…	12163019	40	not necessary
Caelo	Aluminium oxide,…	13119121	40	not necessary
Caelo	Aluminium potass…	10079208	40	from supplier
Caelo	Aluminium potass…	12144605	40	from supplier
Caelo	American liverwo…	11254605	40	not necessary
Caelo	Ammonium chloride	10176319	40	AR-13-FG-001330-01
Caelo	Ammonium chloride	12356101	40	not necessary
Caelo	Ammonium hydroge…	81675468	40	not necessary
Caelo	Amphetamine sulf…	16153902	40	2017A-03361
Caelo	Amphetamine sulf…	13344603	20	0814J-03361
Caelo	Angelica root	12080404	40	1403053
Caelo	Angelica root	10200705	50	not necessary
Caelo	Angelica root	12080409	40	not necessary
Caelo	Angelica root	09030301	70	F 2009 001 059
Caelo	Angelica root	12168701	40	pending
Caelo	Aniseed	13333903	40	not necessary
Caelo	Aniseed	09325104	80	F 2010 000 053
Caelo	Aniseed	11370301	40	pending
Caelo	Aniseed	11370301	40	not necessary
Caelo	Aniseed, pounded	11242001	40	not necessary
Caelo	Aniseed, pounded	13357101	40	not necessary
Caelo	Aniseed, pounded	12111301	40	not necessary
Caelo	Aniseed, powdered	11306208	40	not necessary
Caelo	Aniseed, powdered	11306204	40	AR-12-FG-007324-02
Caelo	Aniseed, powdered	11306203	40	not necessary
Caelo	Apple, cut	11229807	60	from supplier
Caelo	Arnica flower	11285702	40	not necessary
Caelo	Arnica flower	10187404	40	not necessary
Caelo	Arnica flower	11259801	40	not necessary
Caelo	Artichoke leaf, …	11020602	30	not necessary
Caelo	Artichoke leaf, …	13310707	40	not necessary
Caelo	Artichoke leaf, …	12173302	40	not necessary
Caelo	Artichoke leaf, …	11020602	40	AR-12-FG-007243-01
Caelo	Artichoke leaf, …	11020601	40	not necessary
Caelo	Ash leaf, cut	11031303	40	not necessary
Caelo	Ash leaf, cut	09344910	40	AR-12-FG-008592-01
Caelo	Asparagus root, …	10299012	30	pending

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Supplier	Substance	Batch	Spectra	Certificate
Caelo	Asparagus root, ...	10299010	40	pending
Caelo	Barberries	12217109	60	pending
Caelo	Barberries	14057312	60	1508391
Caelo	Barberries	11058309	40	pending
Caelo	Barberry root ba...	12112601	40	not necessary
Caelo	Barium sulfate	171113	20	20170509*
Caelo	Basil, rubbed	12066404	60	not necessary
Caelo	Basil, rubbed	12007004	40	not necessary
Caelo	Bean shells, cut	08301006	40	not necessary
Caelo	Bean shells, cut	11030601	60	not necessary
Caelo	Bearberry leaf, ...	12186502	40	not necessary
Caelo	Bearberry leaf, ...	91701269	80	F 2009 001 028
Caelo	Bentonite	11304413	30	not necessary
Caelo	Bentonite	11304413	40	not necessary
Caelo	Bentonite	12237603	40	not necessary
Caelo	Bentonite	zu erfassen	40	AR-14-FG-000423-01
Caelo	Benzalkonium chl...	16171603	30	not necessary
Caelo	Betony herb, cut	09286401	70	F 2010 000 059
Caelo	Betony herb, cut	12007201	40	not necessary
Caelo	Betony herb, cut	12007205	40	not necessary
Caelo	Betony herb, cut	12007205	60	not necessary
Caelo	Bilberry fruit, ...	92996429	70	F 2009 001 041
Caelo	Bilberry fruit, ...	10265602	40	not necessary
Caelo	Bilberry leaf, cut	90715249	70	F 2010 000 050
Caelo	Bilberry leaf, cut	12140206	40	not necessary
Caelo	Birch leaf, cut	83445179	70	F 2009 001 022
Caelo	Birch leaf, cut	12193105	40	not necessary
Caelo	Bitter fennel	1019009	40	not necessary
Caelo	Bitter fennel	17020610	40	1708048
Caelo	Bitter fennel	13413702	40	1412549
Caelo	Bitter fennel	12094708	30	pending
Caelo	Bitter fennel	14376403	60	not necessary
Caelo	Bitter fennel	12167102	40	not necessary
Caelo	Bitter fennel	91036399	61	F 2009 001 040
Caelo	Bitter fennel	11185504	80	not necessary
Caelo	Bitter fennel	12094703	30	not necessary
Caelo	Bitter fennel	10109004	40	not necessary
Caelo	Bitter fennel	11016310	30	not necessary
Caelo	Bitter fennel	161603	60	20160718*
Caelo	Bitter fennel	11016318	40	not necessary
Caelo	Bitter orange fl...	11049201	40	not necessary
Caelo	Bitter orange fl...	11049211	40	not necessary
Caelo	Bitter orange fl...	12266703	40	not necessary
Caelo	Bitter orange fl...	zu erfassen	40	not necessary
Caelo	Bitter orange fl...	12266605	40	not necessary
Caelo	Bitter orange fl...	11049212	40	not necessary
Caelo	Bitter orange fl...	11049306	75	not necessary
Caelo	Bitter orange pe...	12067402	40	not necessary
Caelo	Bitter orange pe...	12067405	40	not necessary
Caelo	Bitter orange pe...	12067402	40	not necessary
Caelo	Black cohosh, cut	10281112	40	not necessary
Caelo	Black cohosh, cut	13237903	40	not necessary
Caelo	Black cohosh, cut	13237901	40	pending
Caelo	Black cohosh, cut	10281114	40	not necessary
Caelo	Black cumin seed	11233503	40	1403495
Caelo	Black cumin seed	161157	60	not necessary
Caelo	Black cumin seed	10121916	40	not necessary
Caelo	Black cumin seed	10121913	40	not necessary
Caelo	Black mustard seed	12189303	40	1403472
Caelo	Black mustard seed	11124307	40	not necessary

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Supplier	Substance	Batch	Spectra	Certificate
Caelo	Black mustard seed	15120405	60	AR-17-FG-007964-01
Caelo	Black mustard se…	12350204	80	1403711
Caelo	Black mustard se…	16051807	60	9887
Caelo	Black mustard se…	12009703	40	not necessary
Caelo	Black mustard se…	10064103	40	not necessary
Caelo	Black mustard se…	12009703	40	not necessary
Caelo	Black mustard se…	13358304	40	pending
Caelo	Black pepper	13221114	40	not necessary
Caelo	Black pepper	11193906	40	not necessary
Caelo	Black pepper	12192311	40	1403490
Caelo	Black pepper	11193905	40	not necessary
Caelo	Blackberry leaf,…	08327407	60	not necessary
Caelo	Blackberry leaf,…	11030707	40	not necessary
Caelo	Blackberry leaf,…	10136407	40	AR-12-FG-008205-01
Caelo	Blackberry leaf,…	10136403	40	not necessary
Caelo	Blackcurrant lea…	12168804	40	not necessary
Caelo	Blackcurrant lea…	09373908	40	not necessary
Caelo	Blackcurrants	14212502	60	not necessary
Caelo	Blackcurrants	14212509	60	20140829
Caelo	Blackcurrants	12272801	40	1403468
Caelo	Blackthorn flower	12178101	40	not necessary
Caelo	Blessed thistle,…	12038203	40	not necessary
Caelo	Blessed thistle,…	09355201	40	not necessary
Caelo	Blessed thistle,…	12038203	40	not necessary
Caelo	Blue bottle flow…	10291110	40	pending
Caelo	Blue bottle flow…	13241902	60	AR-15-FG-005838-01
Caelo	Blue bottle flow…	10291105	40	pending
Caelo	Bogbean leaf, cut	12226101	40	not necessary
Caelo	Boldo leaf, cut	10027509	40	not necessary
Caelo	Boldo leaf, cut	13367904	40	not necessary
Caelo	Borage herb, cut	11206712	40	not necessary
Caelo	Bucho leaf	12034903	40	not necessary
Caelo	Buckwheat herb, …	11212806	40	not necessary
Caelo	Buprenorphine hy…	16143001	40	0718E-07774
Caelo	Buprenorphine hy…	16143001	40	2017A-07774
Caelo	Buprenorphine hy…	12172908	20	0814I-07774
Caelo	Buprenorphine hy…	10242705	40	not necessary
Caelo	Buprenorphine hy…	16143001	40	0718E-07774
Caelo	Burdock root, cut	11100801	40	not necessary
Caelo	Burdock root, cut	82227239	80	F 2009 001 060
Caelo	Burnet root	12024406	40	not necessary
Caelo	Burnet root	09331503	40	not necessary
Caelo	Burnet root	12027410	40	not necessary
Caelo	Burnet root	12027407	40	not necessary
Caelo	Calcium chloride…	10103114	40	not necessary
Caelo	Calcium hydrogen…	10135201	40	not necessary
Caelo	Calcium sulfate …	10132401	40	not necessary
Caelo	Calcium sulfate …	09246306	40	not necessary
Caelo	Calendula flower	11221404	40	not necessary
Caelo	Calendula flower…	10118307	50	not necessary
Caelo	Calendula flower…	09157609	40	not necessary
Caelo	Calendula flower…	11187605	40	not necessary
Caelo	Calendula flower…	11187605	40	not necessary
Caelo	Campeche wood	11074105	40	from supplier
Caelo	Campeche wood	11074108	40	from supplier
Caelo	Caraway fruit	09267815	40	AR-12-FG-007975-01
Caelo	Caraway fruit	11003201	40	not necessary
Caelo	Caraway fruit	13306006	60	AR-16-FG-000540-03
Caelo	Caraway fruit	15097115	60	AR-17-FG-006649-01
Caelo	Caraway fruit	09334905	80	AR-12-FG-002707-01

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Supplier	Substance	Batch	Spectra	Certificate
Caelo	Caraway fruit	09267816	50	not necessary
Caelo	Caraway fruit	13397104	60	AR-15-FG-001527-01
Caelo	Caraway fruit	11003217	40	not necessary
Caelo	Caraway fruit	13397104	40	AR-15-FG-001526-01
Caelo	Caraway fruit	09267814	40	not necessary
Caelo	Caraway fruit	09267825	40	not necessary
Caelo	Caraway fruit, p…	14358801	60	AR-15-FG-014914-01
Caelo	Caraway fruit, p…	16073201	60	AR-17-FG-006648-01
Caelo	Caraway fruit, p…	12116901	40	1403469
Caelo	Caraway fruit, p…	12116904	40	not necessary
Caelo	Caraway fruit, p…	13367101	40	not necessary
Caelo	Carbachol	11150302	40	1401147
Caelo	Cardamom fruit	11309107	40	not necessary
Caelo	Cardamom fruit	13260504	40	not necessary
Caelo	Cardamom fruit	zu erfassen	40	not necessary
Caelo	Cardamom fruit	10285713	40	not necessary
Caelo	Cardamom, excort…	13026104	40	1405002
Caelo	Cardamom, excort…	11247103	40	not necessary
Caelo	Carnauba wax	170903	40	20170512*
Caelo	Carrageenan, cut	11053905	40	not necessary
Caelo	Castoreum, powde…	zu erfassen	40	pending
Caelo	Castoreum, powde…	09117503	50	pending
Caelo	Castoreum, powde…	12137409	40	1402590
Caelo	Castoreum, powde…	13410403	40	not necessary
Caelo	Castoreum, powde…	13410403	40	not necessary
Caelo	Cayenne pepper, …	12014405	40	pending
Caelo	Cayenne pepper, …	14103104	60	not necessary
Caelo	Cayenne pepper, …	10197606	40	AR-12-FG-008515-01
Caelo	Celery root, cut	10270002	40	not necessary
Caelo	Centaury, cut	11097602	40	not necessary
Caelo	Centaury, cut	91233419	80	F 2009 001 045
Caelo	Ceylonese Cinnam…	12242806	40	1403083
Caelo	Ceylonese Cinnam…	12242810	40	not necessary
Caelo	Chelidonium maju…	13774	80	from supplier
Caelo	Chickweed, cut	10359112	40	not necessary
Caelo	Chickweed, cut	13254411	40	1412550
Caelo	Chickweed, cut	13040502	40	1403482
Caelo	Chicory herb, cut	12034303	40	not necessary
Caelo	Chicory herb, cut	12034303	100	not necessary
Caelo	Chicory herb, cut	09355304	40	not necessary
Caelo	Chicory herb, cut	12354302	100	not necessary
Caelo	Chicory root, cut	11081805	40	not necessary
Caelo	Chicory root, cut	11374504	40	not necessary
Caelo	Cinchona bark, cut	15301903	60	AR-17-FG-007831-01
Caelo	Cinchona bark, cut	11238512	40	1403463
Caelo	Cinchona bark, cut	14009304	40	AR-15-FG-007677-01
Caelo	Cinchona bark, cut	zu erfassen	40	not necessary
Caelo	Cinchona bark, cut	13031007	40	not necessary
Caelo	Cinnamon rods (C…	13241807	40	not necessary
Caelo	Cinnamon rods (C…	11247009	40	AR-12-FG-008665-01
Caelo	Cinnamon, cut	12309902	40	pending
Caelo	Cinnamon, cut	zu erfassen	40	not necessary
Caelo	Cinnamon, cut	14175010	60	1505349
Caelo	Cinnamon, cut	16114401	60	1704441
Caelo	Cinnamon, cut	11221004	40	AR-12-FG-008664-01
Caelo	Cinnamon, cut	13304414	40	not necessary
Caelo	Clove	10242010	40	AR-12-FG-008490-01
Caelo	Clove	12095805	40	pending
Caelo	Clove	16207804	60	1708676
Caelo	Clove, powdered …	12355301	40	1403054

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Supplier	Substance	Batch	Spectra	Certificate
Caelo	Clove, powdered …	12355304	40	not necessary
Caelo	Cocaine hydrochl…	16142710	40	1917T-01278
Caelo	Cocaine hydrochl…	17003902	40	1917S-01278
Caelo	Cocaine hydrochl…	15224802	20	1316Q-01278
Caelo	Cocaine hydrochl…	15224802	20	1316Q-01278
Caelo	Cocaine hydrochl…	13259305	20	0814J-01278
Caelo	Cocaine hydrochl…	15224802	20	1316Q-01278
Caelo	Cocaine hydrochl…	16142710	40	1917T-01278
Caelo	Cocaine hydrochl…	15224802	20	1316Q-01278
Caelo	Cocoa bark, cut	11291008	40	not necessary
Caelo	Codeine phosphat…	11234808	40	not necessary
Caelo	Codeine phosphat…	16169807	40	2017B-01279
Caelo	Codeine phosphat…	15350703	20	1316R-01279
Caelo	Codeine phosphat…	16349702	40	2017C-01279
Caelo	Codeine phosphat…	15350703	30	1316R-01279
Caelo	Codeine phosphat…	13071504	20	0814J-01279
Caelo	Codeine phosphat…	16349702	40	2017C-01279
Caelo	Codeine phosphat…	16169807	40	2017B-01279
Caelo	Common broom her…	zu erfassen	40	not necessary
Caelo	Common madder ro…	11070908	40	not necessary
Caelo	Common wormwood …	12016705	40	not necessary
Caelo	Common wormwood …	83410339	70	F 2010 000 057
Caelo	Copper (II) sulf…	08258803	40	not necessary
Caelo	Coriander	11088402	40	AR-12-FG-008489-01
Caelo	Coriander	13299403	40	1412548
Caelo	Coriander	12080904	40	pending
Caelo	Coriander	16010212	60	AR-17-FG-015965-01
Caelo	Coriander	11088402	40	not necessary
Caelo	Cottonwood bud	12027502	40	not necessary
Caelo	Cottonwood bud	12027505	40	not necessary
Caelo	Couch grass rhiz…	10049612	40	not necessary
Caelo	Couch grass rhiz…	10049607	50	not necessary
Caelo	Couch grass rhiz…	10049612	50	not necessary
Caelo	Couch grass rhiz…	12186702	40	not necessary
Caelo	Cowberry leaf, cut	11334302	40	not necessary
Caelo	Cowberry leaf, cut	11334302	40	not necessary
Caelo	Cumin	11378308	40	not necessary
Caelo	Daisy flower	11068301	40	not necessary
Caelo	Daisy flower	11068306	40	not necessary
Caelo	Damiana leaf, cut	11026606	40	not necessary
Caelo	Damiana leaf, cut	11026609	40	not necessary
Caelo	Damiana leaf, cut	11026608	40	not necessary
Caelo	Dandelion herb w…	11030305	40	AR-12-FG-008590-01
Caelo	Dandelion herb w…	10121614	40	not necessary
Caelo	Dandelion herb w…	07341702	120	F 2009 001 050
Caelo	Dandelion herb w…	11217109	40	not necessary
Caelo	Dandelion herb w…	11217109	40	not necessary
Caelo	Dandelion root, …	13329708	40	1411089
Caelo	Dandelion root, …	10024710	40	not necessary
Caelo	Dandelion root, …	13329701	40	not necessary
Caelo	Dandelion root, …	12363102	40	1403708
Caelo	Dandelion root, …	10024714	50	not necessary
Caelo	Devil's claw root	80278288	70	F 2010 000 065
Caelo	Devil's claw root	12031806	40	not necessary
Caelo	Devil's claw root	13298202	40	not necessary
Caelo	Dihydrocodeine h…	15295910	40	2017B-03065
Caelo	Dihydrocodeine h…	13267601	20	0914A-03065
Caelo	Dihydrocodeine h…	15295910	40	2017B-03065
Caelo	Dihydrocodeine h…	10223612	40	not necessary
Caelo	Dihydrocodeine h…	15295901	20	1316Q-03065

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Supplier	Substance	Batch	Spectra	Certificate
Caelo	Dihydrocodeine h...	16106209	40	2017C-03065
Caelo	Dihydrocodeine h...	16106209	40	2017C-03065
Caelo	Dihydrocodeine h...	15295901	20	1316Q-03065
Caelo	Dihydrocodeine h...	12142506	20	0914B-03065
Caelo	Dill fruit	12038301	40	not necessary
Caelo	Dill fruit	14018705	60	pending
Caelo	Dill fruit	12038301	40	pending
Caelo	Dill fruit	12342906	40	not necessary
Caelo	Dill fruit	12289901	40	1403464
Caelo	Dill herb, cut	13007610	40	not necessary
Caelo	Dill herb, cut	13007602	40	1402204
Caelo	Dill herb, cut	11295103	40	not necessary
Caelo	Dill herb, cut	11295107	40	pending
Caelo	Dithranol	90987209	32	I 2009 000 268
Caelo	Dry beads Caelo...	12382203	40	from supplier
Caelo	Dry beads Caelo...	11005804	40	from supplier
Caelo	Echinacea pallid...	12244501	40	not necessary
Caelo	Echinacea pallid...	14120602	40	not necessary
Caelo	Elder berries	13367704	40	1410179
Caelo	Elder berries	12267807	40	1403466
Caelo	Elder flower, ru...	83446199	70	F 2009 001 019
Caelo	Elder flower, ru...	12221902	40	not necessary
Caelo	Elecampane rhizo...	12113303	40	not necessary
Caelo	Elecampane rhizo...	11196905	40	not necessary
Caelo	Eleutherococcus,...	09035506	50	not necessary
Caelo	Eleutherococcus,...	10381814	30	not necessary
Caelo	Eleutherococcus,...	10381814	40	not necessary
Caelo	Elm bark, cut	10347205	40	not necessary
Caelo	Elm bark, cut	10347205	60	not necessary
Caelo	Equisetum stem, ...	11076307	40	not necessary
Caelo	Equisetum stem, ...	10375515	40	not necessary
Caelo	Equisetum stem, ...	91234289	70	F 2009 001 048
Caelo	Eucalyptus leaf,...	11307706	40	not necessary
Caelo	Eucalyptus leaf,...	09346804	40	not necessary
Caelo	Euphrasy herb, cut	09311412	50	not necessary
Caelo	Fenugreek	08329901	70	F 2010 000 068
Caelo	Fenugreek	11313204	40	not necessary
Caelo	Fenugreek, powde...	11042303	40	AR-12-FG-007209-01
Caelo	Fenugreek, powde...	11042302	40	not necessary
Caelo	Fenugreek, powde...	11042306	40	pending
Caelo	Fenugreek, powde...	12149605	40	not necessary
Caelo	Fenugreek, powde...	15308704	60	AR-17-FG-006625-01
Caelo	Ferric (III) sul...	10354412	40	AR-13-FG-002914-01
Caelo	Flax weed herb, ...	13007505	40	1403462
Caelo	Flax weed herb, ...	09346401	30	pending
Caelo	Flax weed herb, ...	14005309	60	not necessary
Caelo	Frangula bark, cut	12185901	40	not necessary
Caelo	Frangula bark, cut	11254001	40	not necessary
Caelo	Frangula bark, cut	10069607	100	AR-12-FG-002850-01
Caelo	Frankincense	12120005	40	1402495
Caelo	Frankincense	13112801	40	not necessary
Caelo	Frankincense	10349210	40	not necessary
Caelo	Frankincense	100546	40	not necessary
Caelo	Frankincense	10054608	40	not necessary
Caelo	Frankincense	zu erfassen	40	not necessary
Caelo	Fraxinella root,...	10189103	40	not necessary
Caelo	Fraxinella root,...	11314705	40	pending
Caelo	Fraxinella root,...	14110802	60	not necessary
Caelo	Fraxinella root,...	11314705	80	not necessary
Caelo	Fumitory, cut	83129399	69	F 2009 001 049

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Supplier	Substance	Batch	Spectra	Certificate
Caelo	Fumitory, cut	12103402	40	not necessary
Caelo	Galangal root	14159504	60	1511617
Caelo	Galangal root	12125001	40	not necessary
Caelo	Galangal root	12330308	40	not necessary
Caelo	Galangal root	12330305	40	1403491
Caelo	Galangal root	11375904	40	not necessary
Caelo	Galangal root	11196506	40	pending
Caelo	Galangal root	11048908	40	not necessary
Caelo	Galangal root	11375909	40	1403324
Caelo	Garden violet, cut	08061209	40	not necessary
Caelo	Garden violet, cut	13232103	40	not necessary
Caelo	Garden violet, cut	13038703	40	1403481
Caelo	Garden violet, cut	10292002	40	pending
Caelo	Gentian root, cut	12244603	40	not necessary
Caelo	Gentian root, cut	10263402	40	AR-12-FG-007932-01
Caelo	Gentian root, cut	10263402	40	not necessary
Caelo	Gentian root, po…	12007103	50	1403630
Caelo	Gentian root, po…	12007106	40	not necessary
Caelo	Gentian root, po…	13410503	40	1508394
Caelo	Gentian root, po…	09130203	50	not necessary
Caelo	Ginger, peeled	12180601	40	not necessary
Caelo	Ginger, peeled	14120701	40	not necessary
Caelo	Ginger, peeled	13321904	40	not necessary
Caelo	Ginger, peeled	11325715	40	not necessary
Caelo	Ginkgo extract	12192505	40	1403672
Caelo	Ginkgo leaf, cut	12151703	40	not necessary
Caelo	Ginkgo leaf, cut	13340907	60	not necessary
Caelo	Ginkgo leaf, cut	16281501	60	1708047
Caelo	Ginkgo leaf, cut	12151703	40	1403707
Caelo	Ginkgo leaf, cut	13340904	40	1411088
Caelo	Ginseng root	12080208	40	not necessary
Caelo	Ginseng root	11349206	30	not necessary
Caelo	Ginseng root	13237805	40	not necessary
Caelo	Ginseng root	13341008	40	not necessary
Caelo	Goat's rue, cut	11175104	40	not necessary
Caelo	Goat's rue, cut	11307903	40	not necessary
Caelo	Goat's rue, cut	10022115	60	not necessary
Caelo	Ground ivy herb,…	10227602	40	AR-12-FG-008589-01
Caelo	Guaiacum wood, cut	11352012	40	not necessary
Caelo	Guaiacum wood, cut	11352001	40	1406340
Caelo	Guaiacum wood, cut	13343802	40	not necessary
Caelo	Guaiacum wood, cut	10143017	40	not necessary
Caelo	Hamamelis bark, …	12361301	40	not necessary
Caelo	Hamamelis bark, …	10140405	40	not necessary
Caelo	Hamamelis bark, …	zu erfassen	40	not necessary
Caelo	Hamamelis bark, …	12361303	40	not necessary
Caelo	Hamamelis leaf, …	13269904	40	not necessary
Caelo	Hamamelis leaf, …	zu erfassen	40	not necessary
Caelo	Hamamelis leaf, …	10102915	40	not necessary
Caelo	Hamamelis leaf, …	10102915	40	not necessary
Caelo	Hamamelis leaf, …	13269902	40	1405176
Caelo	Hawthorn flower	13010403	40	not necessary
Caelo	Hawthorn flower	10157201	80	not necessary
Caelo	Hawthorn flower	10157201	40	not necessary
Caelo	Hawthorn fruit	11183010	40	not necessary
Caelo	Hawthorn fruit	11278205	40	not necessary
Caelo	Hawthorn fruit	11183003	40	not necessary
Caelo	Hawthorn fruit	11278203	40	not necessary
Caelo	Hawthorn leaf wi…	10273515	40	not necessary
Caelo	Hawthorn leaf wi…	10377902	50	not necessary

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Supplier	Substance	Batch	Spectra	Certificate
Caelo	Hawthorn leaf wi…	10273507	40	AR-12-FG-008080-01
Caelo	Hawthorn leaf wi…	10273513	40	not necessary
Caelo	Hawthorn leaf wi…	09363904	40	not necessary
Caelo	Hawthorn leaf wi…	13276706	40	not necessary
Caelo	Hay flower	12317104	40	not necessary
Caelo	Hay flower	82612379	80	F 2009 001 015
Caelo	Heather flower, …	10270508	40	not necessary
Caelo	Heather, cut	11011209	40	not necessary
Caelo	Heather, cut	09291512	40	not necessary
Caelo	Heavy alkaline b…	11052805	40	not necessary
Caelo	Heavy, basic mag…	10290208	40	not necessary
Caelo	Henna powder	13298604	40	not necessary
Caelo	Henna powder	12267304	30	from supplier
Caelo	Henna powder	11048703	40	from supplier
Caelo	Henna powder	10220907	40	from supplier
Caelo	Henna powder	12122302	30	from supplier
Caelo	Henna powder	13262801	40	not necessary
Caelo	Hop strobile	12008305	40	not necessary
Caelo	Hop strobile	82463349	80	F 2009 001 080
Caelo	Hop strobile	12008305	40	not necessary
Caelo	Hop strobile	12221802	40	not necessary
Caelo	Hop strobile	10240317	40	not necessary
Caelo	Horse chestnut l…	83418159	70	F 2010 000 048
Caelo	Horse chestnut l…	11063503	40	not necessary
Caelo	Hydromorphone hy…	10157908	80	not necessary
Caelo	Hydromorphone hy…	11029713	40	not necessary
Caelo	Hydromorphone hy…	15393602	20	1516J-01334
Caelo	Hydromorphone hy…	16123804	40	1917R-01334
Caelo	Hydromorphone hy…	15393602	20	1516J-01334
Caelo	Hydromorphone hy…	13267702	20	0914A-01334
Caelo	Hydromorphone hy…	16123804	40	1917R-01334
Caelo	Hyssop herb, cut	11040908	40	not necessary
Caelo	Iceland moss, cut	12187106	40	1403493
Caelo	Iceland moss, cut	09355507	40	not necessary
Caelo	Iceland moss, cut	13350803	40	not necessary
Caelo	Iodine	10237809	40	not necessary
Caelo	Iron (II) sulfat…	11340509	40	1401568
Caelo	Iron (III) chlor…	12354703	40	1401391
Caelo	Isomalt	170812	40	20170421*
Caelo	Ispaghula husk	12148103	40	not necessary
Caelo	Ispaghula husk	13238005	40	not necessary
Caelo	Ispaghula seed	11185812	40	not necessary
Caelo	Ispaghula seed	11185807	40	not necessary
Caelo	Ivy leaf, cut	09355008	40	AR-12-FG-008538-01
Caelo	Ivy leaf, cut	13276304	40	not necessary
Caelo	Ivy leaf, cut	11101106	40	not necessary
Caelo	Ivy leaf, cut	11229505	40	not necessary
Caelo	Jasmine flower	12143201	40	not necessary
Caelo	Java tea, cut	13258805	40	not necessary
Caelo	Java tea, cut	10184709	40	AR-12-FG-008079-01
Caelo	Java tea, cut	12225702	40	not necessary
Caelo	Juniper	10311601	50	not necessary
Caelo	Juniper	12028609	40	not necessary
Caelo	Juniper	13267210	40	not necessary
Caelo	Juniper, pounded	12113701	40	not necessary
Caelo	Juniper, pounded	12278903	40	1405296
Caelo	Juniper, pounded	13367302	40	not necessary
Caelo	Juniper, powdered	05031207	40	not necessary
Caelo	Kaolin, heavy	11350124	40	not necessary
Caelo	Kaolin, heavy	82043269	40	from supplier

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Supplier	Substance	Batch	Spectra	Certificate
Caelo	Kaolin, red, pow…	12093503	40	from supplier
Caelo	Kelp, cut	15418801	60	AR-17-FG-007505-01
Caelo	Kelp, cut	13230805	40	AR-15-FG-007678-01
Caelo	Kelp, cut	11351105	40	pending
Caelo	Kidney vetch, co…	10249206	40	not necessary
Caelo	Knotgrass, cut	11369702	40	not necessary
Caelo	Knotgrass, cut	11369301	40	not necessary
Caelo	Knotgrass, cut	14079304	40	not necessary
Caelo	Knotgrass, cut	zu erfassen	40	not necessary
Caelo	Ladys bedstraw …	11265103	40	not necessary
Caelo	Ladys bedstraw …	82879439	70	F 2010 000 060
Caelo	Lapacho wood, cut	11154503	40	1403811
Caelo	Lapacho wood, cut	12239305	40	not necessary
Caelo	Large waybread h…	10349610	40	not necessary
Caelo	Laurel leaf	12299103	40	not necessary
Caelo	Laurel leaf	11223609	40	not necessary
Caelo	Laurel leaf	11223607	40	not necessary
Caelo	Lavender flower	10144302	40	AR-12-FG-003625-01
Caelo	Lavender flower	13336005	40	from supplier
Caelo	Lavender flower	11327903	40	not necessary
Caelo	Lavender flower	12088003	60	not necessary
Caelo	Lemon grass, cut	11301503	40	not necessary
Caelo	Lemon peel, cut	12217402	40	not necessary
Caelo	Lemon peel, cut	zu erfassen	40	not necessary
Caelo	Lemon verbena le…	12137503	40	not necessary
Caelo	Lemon verbena le…	12137505	40	not necessary
Caelo	Lime flower, cut	91680399	70	F 2009 001 020
Caelo	Lime flower, cut	11086305	55	not necessary
Caelo	Linseed	12186902	60	pending
Caelo	Linseed	91729389	70	F 2010 000 069
Caelo	Linseed	13412801	40	not necessary
Caelo	Linseed	13296703	40	not necessary
Caelo	Linseed	12092102	60	not necessary
Caelo	Liqourice root, …	90659329	70	F 2009 001 062
Caelo	Liqourice root, …	11351911	40	not necessary
Caelo	Liqourice root, …	12227106	40	not necessary
Caelo	Liqourice root, …	11002811	40	AR-13-FG-000112-01
Caelo	Liqourice root, …	12227101	40	not necessary
Caelo	Liquorice	13180904	60	pending
Caelo	Liquorice	14050601	25	not necessary
Caelo	Liquorice	13262501	40	pending
Caelo	Liquorice	13068904	40	not necessary
Caelo	Liquorice	11267801	40	pending
Caelo	Liquorice root, …	12267103	40	not necessary
Caelo	Locust bean gum,…	13379403	40	from supplier
Caelo	Locust bean gum,…	10376516	40	not necessary
Caelo	Lovage root, cut	11181609	40	not necessary
Caelo	Lovage root, cut	10249312	30	not necessary
Caelo	Lungwort herb, cut	11021701	40	not necessary
Caelo	Lycopodium herb,…	73075379	60	F 2009 001 051
Caelo	Mace, powdered (…	14256901	60	pending
Caelo	Mace, powdered (…	14256901	60	not necessary
Caelo	Mace, powdered (…	13132204	40	pending
Caelo	Mace, powdered (…	13132201	40	not necessary
Caelo	Magensium hydrog…	12181911	40	not necessary
Caelo	Magnesium chlori…	11345606	40	AR-13-FG-005982-01
Caelo	Magnesium chlori…	11218705	40	AR-12-FG-007022-01
Caelo	Magnesium chlori…	11032304	50	not necessary
Caelo	Magnesium chlori…	11032316	40	not necessary
Caelo	Magnesium chlori…	10043911	40	not necessary

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Supplier	Substance	Batch	Spectra	Certificate
Caelo	Magnesium hydrox…	16253301	40	not necessary
Caelo	Magnesium sulfat…	11231006	40	AR-12-FG-007046-01
Caelo	Magnesium sulfat…	13340814	60	not necessary
Caelo	Magnesium sulfat…	09246402	40	not necessary
Caelo	Magnesium sulfat…	09377510	40	not necessary
Caelo	Maize style, cut	10325906	40	not necessary
Caelo	Maize style, cut	09074201	70	F 2009 001 078
Caelo	Maize style, cut	10325902	40	not necessary
Caelo	Maize style, cut	13381501	40	not necessary
Caelo	Male speedwell w…	12162503	40	not necessary
Caelo	Male speedwell w…	11265501	40	not necessary
Caelo	Male speedwell w…	11265502	40	AR-12-FG-008537-01
Caelo	Mallow flower, cut	09311103	69	F 2010 000 045
Caelo	Mallow flower, cut	12187405	40	not necessary
Caelo	Mallow flower, cut	09311103	50	not necessary
Caelo	Mallow leaf, cut	10290507	50	not necessary
Caelo	Mallow leaf, cut	10054507	40	from supplier
Caelo	Mallow leaf, cut	12153403	40	not necessary
Caelo	Manganese sulfat…	91547399	40	AR-13-FG-000299-01
Caelo	Manna, cut	11308907	60	pending
Caelo	Manna, cut	82063319	80	F 2010 000 064
Caelo	Manna, cut	13127007	40	pending
Caelo	Manna, powdered	14001401	40	not necessary
Caelo	Manna, powdered	11003608	40	not necessary
Caelo	Manna, powdered	11308807	40	1403534
Caelo	Marian thistle f…	11126703	40	not necessary
Caelo	Marian thistle f…	90494349	70	F 2009 001 039
Caelo	Marian thistle f…	13342002	40	from supplier
Caelo	Marian thistle f…	10270610	40	not necessary
Caelo	Marian thistle h…	10326301	40	not necessary
Caelo	Marian thistle h…	10365601	40	not necessary
Caelo	Marian thistle h…	10315902	40	AR-12-FG-008389-01
Caelo	Marian thistle h…	10365601	40	not necessary
Caelo	Marjoram herb, r…	90319439	70	F 2009 001 052
Caelo	Marrubium vulgar…	11073110	40	not necessary
Caelo	Marshmallow leaf…	11101005	40	not necessary
Caelo	Marshmallow leaf…	12328206	40	not necessary
Caelo	Marshmallow leaf…	11101007	40	not necessary
Caelo	Marshmallow leaf…	11100902	40	AR-12-FG-008596-01
Caelo	Marshmallow root…	13214804	40	not necessary
Caelo	Marshmallow root…	81892149	80	F 2009 001 058
Caelo	Marshmallow root…	11101905	40	not necessary
Caelo	Masterwort root,…	13341204	40	not necessary
Caelo	Masterwort root,…	12101804	60	not necessary
Caelo	Masterwort root,…	12101801	40	not necessary
Caelo	Maté leaf, cut	13118004	40	not necessary
Caelo	Maté leaf, cut	10126408	40	not necessary
Caelo	Maté leaf, cut	11091707	40	not necessary
Caelo	Maté leaf, cut	11091707	40	not necessary
Caelo	Matricaria flower	91357379	70	F 2010 000 044
Caelo	Matricaria flower	12294804	40	not necessary
Caelo	Matricaria flower	11214806	40	not necessary
Caelo	Matricaria flower	11255204	80	not necessary
Caelo	Matricaria flower	10014213	39	not necessary
Caelo	Matricaria flower	12337605	40	not necessary
Caelo	Matricaria flowe…	12115805	40	not necessary
Caelo	Meadowsweet flow…	12275701	40	not necessary
Caelo	Meadowsweet flow…	08223003	70	F 2010 000 047
Caelo	Meadowsweet herb…	09171501	80	F 2009 001 054
Caelo	Melilot herb, cut	83011399	70	F 2010 000 062

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Supplier	Substance	Batch	Spectra	Certificate
Caelo	Melissa leaf, cut	12032318	40	not necessary
Caelo	Melissa leaf, cut	10310911	30	not necessary
Caelo	Melissa leaf, cut	13214713	40	not necessary
Caelo	Melissa leaf, cut	90984399	100	F 2009 001 023
Caelo	Methadone hydroc...	15244715	20	1516A-02949
Caelo	Methadone hydroc...	16135309	40	1917R-02949
Caelo	Methadone hydroc...	11043910	40	not necessary
Caelo	Methadone hydroc...	16135309	40	1917R-02949
Caelo	Methadone hydroc...	12344818	20	0914E-02949
Caelo	Methadone hydroc...	15244715	20	1516A-02949
Caelo	Methylrosanilini...	12276308	40	1509299
Caelo	Metoclopramide h...	15421102	40	not necessary
Caelo	Metoclopramide h...	14193102	60	not necessary
Caelo	Metoclopramide h...	14193102	60	AR-15-FG-002889-01
Caelo	Metoclopramide h...	15421101	40	not necessary
Caelo	Midazolam hydroc...	15224611	40	1917S-03538
Caelo	Midazolam hydroc...	15224611	30	1917S-03538
Caelo	Midazolam hydroc...	15224602	20	1516B-03538
Caelo	Midazolam hydroc...	15224602	20	1516B-03538
Caelo	Midazolam hydroc...	12215811	20	0914E-03538
Caelo	Midazolam hydroc...	11184701	40	not necessary
Caelo	Mistletoe, cut	11294003	40	not necessary
Caelo	Mistletoe, cut	08189101	70	F 2009 001 056
Caelo	Molecular distil...	11160012	40	not necessary
Caelo	Morphine hydroch...	16184605	40	1917S-01879
Caelo	Morphine hydroch...	13349505	20	0914F-01879
Caelo	Morphine hydroch...	15439404	20	1416R-01879
Caelo	Morphine hydroch...	15439411	40	1917R-01879
Caelo	Morphine hydroch...	15439411	40	1917R-01879
Caelo	Morphine hydroch...	15439404	20	1416R-01879
Caelo	Morphine hydroch...	13125207	20	0914E-01879
Caelo	Morphine sulfate	15295802	40	1917R-07776
Caelo	Morphine sulfate	15255703	20	1416Q-07776
Caelo	Morphine sulfate	15295802	40	1917R-07776
Caelo	Morphine sulfate	11333103	20	0914E-07776
Caelo	Morphine sulfate	12153212	60	0914F-07776
Caelo	Morphine sulfate	15255703	20	1416Q-07776
Caelo	Motherwort herb,...	10244612	40	not necessary
Caelo	Motherwort herb,...	09336508	40	AR-12-FG-008693-01
Caelo	Motherwort herb,...	zu erfassen	40	not necessary
Caelo	Mullein flower	11366403	40	not necessary
Caelo	Mullein flower, ...	91937409	70	F 2009 001 021
Caelo	Mullein flower, ...	11233402	60	not necessary
Caelo	Myrrh	12269901	40	1403470
Caelo	Myrrh	11277111	60	1403081
Caelo	Myrrh	10057904	40	pending
Caelo	Myrrh	13108701	40	AR-15-FG-000946-01
Caelo	Nettle leaf, cut	83142389	79	F 2009 001 027
Caelo	Nettle leaf, cut	10161802	50	not necessary
Caelo	Nettle leaf, cut	12184702	40	not necessary
Caelo	Nettle root, cut	11254903	40	not necessary
Caelo	Nettle root, cut	11254903	40	not necessary
Caelo	Nettle seed	11126212	40	not necessary
Caelo	Nettle seed	11126211	40	pending
Caelo	Nettle seed	12131507	40	1402203
Caelo	Nettle seed	13387110	40	1410300
Caelo	Nutmeg	13266002	40	not necessary
Caelo	Nutmeg	12067304	40	not necessary
Caelo	Nutmeg, powdered...	10085809	50	pending
Caelo	Nutmeg, powdered...	13097204	40	1403540

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Supplier	Substance	Batch	Spectra	Certificate
Caelo	Nystatin	16272214	40	not necessary
Caelo	Nystatin	11069721	40	not necessary
Caelo	Nystatin	17025110	40	not necessary
Caelo	Nystatin	10280622	30	not necessary
Caelo	Oak bark, cut	11351207	40	1403492
Caelo	Oak bark, cut	09357416	30	not necessary
Caelo	Oak bark, cut	13360306	40	not necessary
Caelo	Oak bark, cut	10348617	40	not necessary
Caelo	Oak bark, cut	10348603	40	not necessary
Caelo	Oak bark, powdered	11235004	40	not necessary
Caelo	Oat straw, cut	10092003	30	not necessary
Caelo	Oat straw, cut	11280008	40	not necessary
Caelo	Olive leaf	11270106	40	not necessary
Caelo	Olive leaf	12316808	60	AR-15-FG-001051-01
Caelo	Oregano herb	11340703	40	not necessary
Caelo	Orris root	11026705	40	not necessary
Caelo	Orris root	12206701	40	not necessary
Caelo	Orris root	11026702	40	not necessary
Caelo	Orris root	12206802	40	not necessary
Caelo	Oxetacaine	17249805	50	not necessary
Caelo	Oxetacaine	172498	40	20190925*
Caelo	Oxycodone hydroc...	09190426	40	not necessary
Caelo	Oxycodone hydroc...	12268908	20	0914E-07734
Caelo	Oxycodone hydroc...	12268913	20	1416R-07734
Caelo	Oxycodone hydroc...	15220205	40	2017A-07734
Caelo	Oxycodone hydroc...	12268914	20	1416Q-07734
Caelo	Oxycodone hydroc...	12034515	20	0914F-07734
Caelo	Oxycodone hydroc...	12268913	20	1416R-07734
Caelo	Oxycodone hydroc...	15220205	40	2017A-07734
Caelo	Oxycodone hydroc...	12268914	20	1416Q-07734
Caelo	Parsley herb, ru...	10269904	40	not necessary
Caelo	Parsley herb, ru...	10269904	40	not necessary
Caelo	Parsley root, cut	zu erfassen	40	not necessary
Caelo	Parsley root, cut	12080301	40	not necessary
Caelo	Parsley root, cut	10134905	50	not necessary
Caelo	Parsley seed	11157810	40	pending
Caelo	Passionflower he...	10079510	40	not necessary
Caelo	Peppermint leaf,...	11347607	40	not necessary
Caelo	Peppermint leaf,...	11294401	40	not necessary
Caelo	Peppermint leaf,...	10199902	40	not necessary
Caelo	Peppermint leaf,...	12321503	130	not necessary
Caelo	Peppermint leaf,...	91321429	140	F 2010 000 049
Caelo	Peppermint leaf,...	11294411	40	not necessary
Caelo	Peppermint leaf,...	13288303	40	not necessary
Caelo	Phenobarbital	11045503	40	not necessary
Caelo	Phenobarbital	12173202	20	0914E-01040
Caelo	Phenol	11163809	50	not necessary
Caelo	Pine sprouts, cut	11164708	60	not necessary
Caelo	Pine sprouts, cut	13256105	40	not necessary
Caelo	Piper cubeba	11081903	40	not necessary
Caelo	Podophyllum resi...	09315906	50	not necessary
Caelo	Podophyllum resi...	12287810	40	1405242
Caelo	Potassium bromide	11208211	27	not necessary
Caelo	Potassium carbon...	09302910	40	not necessary
Caelo	Potassium hydroc...	10052616	40	AR-12-FG-002698-01
Caelo	Potassium hydroc...	10052622	50	not necessary
Caelo	Potassium hydrog...	172493	40	20170911*
Caelo	Potassium hydrog...	11005709	10	not necessary
Caelo	Potassium hydrox...	10042008	40	not necessary
Caelo	Potassium monohy...	71045347	40	not necessary

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Supplier	Substance	Batch	Spectra	Certificate
Caelo	Potassium monohy…	12366501	40	10401307
Caelo	Potassium perman…	10283104	35	not necessary
Caelo	Primrose flower	10072509	40	not necessary
Caelo	Primrose flower	11268002	40	not necessary
Caelo	Primrose flower	82709399	89	F 2009 001 018
Caelo	Primrose flower	11206806	100	not necessary
Caelo	Primrose root, cut	12064506	40	not necessary
Caelo	Primrose root, cut	10382013	40	not necessary
Caelo	Propolis extract…	13396103	40	not necessary
Caelo	Propolis extract…	13396103	40	not necessary
Caelo	Propolis extract…	11124120	40	1403460
Caelo	Psyllium seed	13305903	40	pending
Caelo	Psyllium seed	10291206	40	pending
Caelo	Psyllium seed	10291205	80	not necessary
Caelo	Psyllium seed	91730289	70	F 2009 001 077
Caelo	Pumpkin seed, pe…	12249006	40	not necessary
Caelo	Pumpkin seed, pe…	12249002	40	1404542
Caelo	Ramsons herb, cut	11182205	40	pending
Caelo	Ramsons herb, cut	12380801	40	1404538
Caelo	Ramsons herb, cut	13072801	40	not necessary
Caelo	Raspberry leaf, …	83211409	70	F 2009 001 025
Caelo	Raspberry leaf, …	12362701	40	not necessary
Caelo	Raspberry leaf, …	09052715	50	not necessary
Caelo	Raspberry leaf, …	09052710	40	not necessary
Caelo	Red poppy petals…	12008104	40	not necessary
Caelo	Red-rose petal	11299204	40	not necessary
Caelo	Red-rose petal, …	09184902	70	F 2010 000 046
Caelo	Red-rose petal, …	11304912	40	not necessary
Caelo	Redwood	12049604	40	not necessary
Caelo	Redwood	12049603	40	1403471
Caelo	Restharrow root,…	91697439	69	F 2010 000 066
Caelo	Restharrow root,…	12330001	40	not necessary
Caelo	Rhubarb, cut	11057818	40	not necessary
Caelo	Rhubarb, cut	12211906	40	not necessary
Caelo	Rhubarb, cut	09213604	40	not necessary
Caelo	Rhubarb, cut	13235213	40	not necessary
Caelo	Rhubarb, cut	11057818	40	not necessary
Caelo	Rhubarb, powdered	16009901	26	9886
Caelo	Rhubarb, powdered	11043818	60	1403280
Caelo	Rhubarb, powdered	10162405	50	not necessary
Caelo	Ribwort plantain…	09297505	40	not necessary
Caelo	Ribwort plantain…	12362902	40	not necessary
Caelo	Ribwort plantain…	10315701	50	not necessary
Caelo	Ribwort plantain…	10315703	40	not necessary
Caelo	Ribwort plantain…	10328701	40	not necessary
Caelo	Ribwort plantain…	82678059	60	F 2009 001 024
Caelo	Rifaximin	161053	60	20160607*
Caelo	Robert herb, cut	10008504	40	not necessary
Caelo	Rose hips peel, …	11301403	40	not necessary
Caelo	Rose hips peel, …	11301407	60	not necessary
Caelo	Rose hips peel, …	90907504	73	from supplier
Caelo	Rose hips with p…	12064202	40	not necessary
Caelo	Rose hips with p…	11232204	40	not necessary
Caelo	Rose hips with p…	09354513	40	not necessary
Caelo	Rose hips with p…	12029002	40	not necessary
Caelo	Rose mallow flow…	82462399	70	F 2009 001 017
Caelo	Rose mallow flow…	10244508	60	not necessary
Caelo	Roselle	10008813	40	not necessary
Caelo	Roselle	00266655	40	from supplier
Caelo	Roselle	11036509	60	not necessary

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Supplier	Substance	Batch	Spectra	Certificate
Caelo	Roselle	12007311	60	not necessary
Caelo	Rosemary leaf, cut	11193408	40	not necessary
Caelo	Rosemary leaf, cut	14159601	60	not necessary
Caelo	Rosemary leaf, cut	10139805	40	not necessary
Caelo	Rosemary leaf, cut	09144202	80	F 2010 000 051
Caelo	Rue herb, cut	09336805	40	not necessary
Caelo	Saffron (spice)	11293404	40	not necessary
Caelo	Saffron filaments	10184819	40	not necessary
Caelo	Sage leaf, cut	11347503	40	not necessary
Caelo	Sage leaf, cut	11056104	40	not necessary
Caelo	Sage leaf, cut	83091439	80	F 2009 001 026
Caelo	Sarsaparilla roo…	10230402	60	not necessary
Caelo	Savory, rubbed	10375313	40	not necessary
Caelo	Senna leaf, cut	90431299	80	F 2010 000 052
Caelo	Senna leaf, cut	12273106	40	not necessary
Caelo	Senna leaf, powd…	12369908	40	1408079
Caelo	Senna leaf, powd…	11193307	120	pending
Caelo	Senna pods, tinn…	11154404	40	not necessary
Caelo	Senna pods, tinn…	13395106	40	not necessary
Caelo	Senna pods, tinn…	12267605	40	not necessary
Caelo	Senna pods, tinn…	10052013	39	not necessary
Caelo	Sesame seed	12125201	40	pending
Caelo	Sesame seed	12310205	40	1403406
Caelo	Shepherd's purse…	11328208	40	not necessary
Caelo	Shepherd's purse…	81468389	70	F 2009 001 044
Caelo	Shepherd's purse…	11328204	40	not necessary
Caelo	Siam benzoin	12321314	40	not necessary
Caelo	Siam benzoin	12321312	40	pending
Caelo	Silver nitrate	11027007	21	not necessary
Caelo	Silverweed, cut	09362602	80	not necessary
Caelo	Silverweed, cut	11016402	40	not necessary
Caelo	Silverweed, cut	11328105	40	not necessary
Caelo	Sodium bromide	10345710	40	AR-13-FG-002996-01
Caelo	Sodium carbonate…	10188901	40	AR-13-FG-000310-01
Caelo	Sodium carbonate…	16310205	30	not necessary
Caelo	Sodium dihydroge…	12198506	40	not necessary
Caelo	Sodium hydrogen …	90962189	40	not necessary
Caelo	Sodium iodide	161701	40	20160706*
Caelo	Sodium monohydro…	08300209	40	not necessary
Caelo	Sodium monohydro…	12109002	40	not necessary
Caelo	Sodium monohydro…	10135302	36	not necessary
Caelo	Sodium nitrate	11045910	40	not necessary
Caelo	Sodium nitrite	171360	40	20170522*
Caelo	Sodium perborate…	11158903	40	not necessary
Caelo	Sodium sulfate d…	10044007	40	not necessary
Caelo	Sodium sulfate d…	11012210	40	not necessary
Caelo	Solanum dulcamar…	13254305	40	not necessary
Caelo	Solanum dulcamar…	08154101	70	F 2009 001 079
Caelo	Solanum dulcamar…	10375602	40	not necessary
Caelo	Solanum dulcamar…	09354613	40	not necessary
Caelo	Sorrel herb, cut	zu erfassen	40	not necessary
Caelo	Sour cherry stem…	10367016	40	1402576
Caelo	Sour cherry stem…	12042302	40	1503570
Caelo	Spearmint leaf, …	12133906	40	not necessary
Caelo	Spearmint leaf, …	zu erfassen	40	not necessary
Caelo	St. John's wort,…	73354159	70	F 2010 000 061
Caelo	St. John's wort,…	09297301	80	not necessary
Caelo	Star anise	11314104	40	not necessary
Caelo	Star anise	83439329	70	F 2009 001 038
Caelo	Star anise, cut	13041401	40	1403709

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Supplier	Substance	Batch	Spectra	Certificate
Caelo	Star anise, cut	12226301	60	pending
Caelo	Star anise, cut	15329302	60	AR-16-FG-004770-01
Caelo	Stemless carline…	91616279	76	F 2009 001 061
Caelo	Stemless carline…	12163702	40	not necessary
Caelo	Stemless carline…	11118001	40	not necessary
Caelo	Stemless carline…	12232802	40	not necessary
Caelo	Strawberry leaf,…	11117903	40	not necessary
Caelo	Strawberry leaf,…	11117902	50	not necessary
Caelo	Sulfamerazine	10218403	40	not necessary
Caelo	Sweet woodruff h…	10375812	30	not necessary
Caelo	Sweet woodruff h…	91789309	70	F 2010 000 058
Caelo	Talcum	10148813	40	not necessary
Caelo	Talcum	11318312	120	1405338
Caelo	Tall golden rod,…	11207014	40	not necessary
Caelo	Tall golden rod,…	11280306	40	not necessary
Caelo	Tall golden rod,…	09116601	80	F 2009 001 053
Caelo	Tall nasturtium …	12031601	40	not necessary
Caelo	Thea Nigra Ceylo…	CH0574162	60	not necessary
Caelo	Thea Nigra Darje…	0558812	40	not necessary
Caelo	Thea Nigra Darje…	0577101	40	not necessary
Caelo	Theriac, powdered	10191904	50	not necessary
Caelo	Theriac, powdered	12289307	40	1405122
Caelo	Theriac, powdered	11082412	40	pending
Caelo	Theriac, powdered	13407301	40	1410336
Caelo	Thiomersal	172173	30	20170919*
Caelo	Thyme, rubbed	09016402	90	F 2009 001 057
Caelo	Thyme, rubbed	11345004	60	not necessary
Caelo	Tonka beans	12105101	40	not necessary
Caelo	Tonka beans	12145101	40	not necessary
Caelo	Tormentil	13220502	40	1403049
Caelo	Tormentil	12040715	40	1403710
Caelo	Tormentil	11102003	40	pending
Caelo	Tormentil	10111704	50	pending
Caelo	Tormentil	12013103	40	1403048
Caelo	Tormentil	14360103	60	1606520
Caelo	Tormentil	10290903	50	not necessary
Caelo	Tormentil	11102003	40	pending
Caelo	Tormentil	12040708	40	1403487
Caelo	Tragacanth, powd…	15379906	60	not necessary
Caelo	Tragacanth, powd…	13277804	60	1507149
Caelo	Tragacanth, powd…	16110802	60	AR-17-FG-007533-01
Caelo	Tragacanth, powd…	09105901	30	not necessary
Caelo	Tragacanth, powd…	15085602	60	not necessary
Caelo	Trichloroacetic …	81332099	20	not necessary
Caelo	Trichloroacetic …	11294306	40	AR-12-FG-004440-01
Caelo	Turmeric root, cut	12136503	40	1405295
Caelo	Turmeric root, cut	11160403	60	not necessary
Caelo	Turmeric root, cut	13360202	40	1411363
Caelo	Turmeric root, cut	10162302	50	not necessary
Caelo	Turmeric, javane…	zu erfassen	40	pending
Caelo	Turmeric, javane…	13262904	40	not necessary
Caelo	Turmeric, javane…	12185605	40	1403465
Caelo	Turmeric, javane…	12319206	40	not necessary
Caelo	Turmeric, javane…	11046305	50	not necessary
Caelo	Valerian root, cut	12033809	40	not necessary
Caelo	Valerian root, cut	90594289	80	F 2009 001 063
Caelo	Valerian root, p…	12138008	40	1508496
Caelo	Valerian root, p…	12138005	40	1403809
Caelo	Valerian root, p…	13113204	60	pending
Caelo	Verbena herb, cut	90526329	70	F 2009 001 055

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Supplier	Substance	Batch	Spectra	Certificate
Caelo	Verbena herb, cut	12187602	40	not necessary
Caelo	Walnut bark, cut	11325603	40	not necessary
Caelo	Walnut bark, cut	09269501	40	not necessary
Caelo	Walnut leaf, cut	10050403	50	not necessary
Caelo	Walnut leaf, cut	11103007	40	1403091
Caelo	Walnut leaf, cut	10050402	40	not necessary
Caelo	White deadnettle...	11371604	40	not necessary
Caelo	White deadnettle...	80213149	70	F 2009 001 016
Caelo	White deadnettle...	11010607	40	not necessary
Caelo	White mustard seed	12361002	40	1403473
Caelo	White mustard seed	13380501	40	not necessary
Caelo	White mustard seed	13064301	40	pending
Caelo	White mustard se...	12375705	40	not necessary
Caelo	White mustard se...	12349601	60	1403281
Caelo	White pepper	14010703	40	not necessary
Caelo	White pepper	12294905	40	not necessary
Caelo	White pepper	12294902	40	1403488
Caelo	Wild pansy, cut	10291007	60	not necessary
Caelo	Wild thyme, cut	zu erfassen	40	not necessary
Caelo	Wild thyme, cut	11031207	40	not necessary
Caelo	Wild thyme, cut	11031204	39	AR-13-FG-000087-01
Caelo	Willow bark, cut	zu erfassen	40	not necessary
Caelo	Willow bark, cut	11073210	40	not necessary
Caelo	Willow bark, cut	12185204	40	not necessary
Caelo	Willow herb, cut	11347311	40	not necessary
Caelo	Willow herb, cut	91115419	70	F 2009 001 047
Caelo	Willowherb, smal...	10326104	40	not necessary
Caelo	Willowherb, smal...	10326106	40	not necessary
Caelo	Willowherb, smal...	10326106	40	not necessary
Caelo	Willowherb, smal...	09378909	40	not necessary
Caelo	Willowherb, smal...	13355904	60	not necessary
Caelo	Willowherb, smal...	73390419	70	F 2009 001 046
Caelo	Wormwood herb, cut	09017102	70	F 2010 000 056
Caelo	Wormwood herb, cut	11285811	40	not necessary
Caelo	Wormwood herb, cut	12355801	40	not necessary
Caelo	Yarrow flower, r...	11106409	40	not necessary
Caelo	Yarrow flower, r...	11106405	40	not necessary
Caelo	Yarrow flower, r...	12267703	40	not necessary
Caelo	Yarrow herb, cut	11280505	40	not necessary
Caelo	Yarrow herb, cut	11280505	40	not necessary
Caelo	Yarrow herb, cut	11092902	40	not necessary
Caelo	Yarrow herb, cut	11218403	80	not necessary
Caelo	Yarrow herb, cut	zu erfassen	40	not necessary
Caelo	Yarrow herb, cut	11092910	50	not necessary
Caelo	Yarrow herb, cut	11280503	40	not necessary
Caelo	Yarrow herb, cut	11218402	40	AR-12-FG-008545-01
Caelo	Yarrow herb, cut	11280505	80	not necessary
Caelo	Yarrow herb, cut	10076901	40	not necessary
Caelo	Yarrow herb, cut	11092911	40	not necessary
Caelo	Yellow brazil wo...	11336405	40	not necessary
Caelo	Yellow brazil wo...	12074803	40	1403479
Caelo	Yellow brazil wo...	12074804	40	not necessary
Caelo	Yellow chaste we...	10244407	40	not necessary
Caelo	Yellow chaste we...	11293101	40	not necessary
Caelo	Yellow chaste we...	10024611	40	AR-12-FG-008692-01
Caelo	Zedoary root, cut	12125301	40	not necessary
Caelo	Zedoary root, cut	82557319	80	F 2009 001 076
Caelo	Zedoary root, cut	11091603	40	not necessary
Caelo	Zedoary root, po...	12344601	40	1403489
Caelo	Zedoary root, po...	13165501	40	pending

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Supplier	Substance	Batch	Spectra	Certificate
Caelo	Zedoary root, po…	14249001	60	not necessary
Caelo	Zinc chloride	11345504	40	not necessary
Caelo	Zinc oxide	14038101	16	not necessary
Caelo	Zinc oxide-talcu…	10192202	40	not necessary
Caelo	Zinc sulfate hep…	12257802	40	not necessary
Caelo	Zinc sulfate hep…	11095602	40	AR-13-FG-006298-01
Carotech	Tocomax 15%	100912	40	from supplier
Carotech	Tocomax 20%	A3_200003_1/5	40	not necessary
Denk	Calcium aspartate	N09814	40	not necessary
Denk	S-adenosyl methi…	S1S1104B	20	from supplier
DKSH Switzerl…	Creatine	921831	30	pending
Dr. Behr	Chlorella	WE11070078	40	pending
Dr. Behr	Chromium yeast 0…	WE-11040062	40	not necessary
Dr. Behr	L-carnitine hydr…	WE11030091	20	from supplier
Dr. Behr	L-carnitine hydr…	1520081202	40	from supplier
Dr. Behr	L-carnitine tart…	WE15080050	20	from supplier
Dr. Behr	Quercetin	WE-13030084-02	40	not necessary
Dr. Behr	Red clover extra…	WE12030050-02	40	pending
Dr. Behr	Yam root extract	WE14020005-05	40	pending
Dr. Behr	Yam root extract	WE12040018-01	40	not necessary
El Compra	Chlorella	WE13010018-01	40	pending
Euro OTC	Aluminium chlori…	1109025-01	40	not necessary
Euro OTC	Aluminium chlori…	1106017-01	40	not necessary
Euro OTC	Ammonium chloride	1209013-01	40	not necessary
Euro OTC	Bentonite	2903008-01	40	from supplier
Euro OTC	Calcium carbonat…	1611008-01	20	not necessary
Euro OTC	Chromium yeast 0…	L1406030-02	60	not necessary
Euro OTC	Chromium yeast 0…	L1303028-01	40	1403474
Euro OTC	Copper orotate d…	2106001Z-01	40	not necessary
Euro OTC	Copper orotate d…	2106001Z-01	40	not necessary
Euro OTC	Curcuma extract …	L1107001	40	not necessary
Euro OTC	Curcuma extract …	L1107001	40	pending
Euro OTC	Curcuma extract …	L1408013	60	not necessary
Euro OTC	D-(+)-mannose	L1111005-02	40	1405612
Euro OTC	D-(+)-mannose	L1503016-01	60	not necessary
Euro OTC	D-(+)-mannose	L1111005-02	40	not necessary
Euro OTC	Deoxycholic acid	1305051-01	40	not necessary
Euro OTC	Devil's claw roo…	1210003-02	40	not necessary
Euro OTC	Devil's claw roo…	1210003-02	40	not necessary
Euro OTC	Devil's claw roo…	1210003-02	40	1707472
Euro OTC	Dithranol	1203025-02	40	not necessary
Euro OTC	EDTA calcium dis…	1705029	40	20170626*
Euro OTC	Frankincense ext…	1611023-01	60	9889
Euro OTC	Frankincense ext…	1104005.01	40	AR-12-FG-008694-01
Euro OTC	Frankincense ext…	1602008	60	20160215*
Euro OTC	Frankincense ext…	1104005-01	40	pending
Euro OTC	Frankincense ext…	1308020-01	60	8958
Euro OTC	Frankincense ext…	1602008	60	20160215*
Euro OTC	Heavy magnesium …	1205012-01	40	not necessary
Euro OTC	Heavy magnesium …	zu erfassen	27	AR-12-FG-008488-01
Euro OTC	L-alanine	1710009	40	20171018*
Euro OTC	L-alanine	1601033-01	40	not necessary
Euro OTC	L-carnitine tart…	1708023	40	20170907*
Euro OTC	Magnesium carbon…	2910023	40	from supplier
Euro OTC	Magnesium oxide,…	1109031	30	from supplier
Euro OTC	Magnesium sulfat…	1202017-01	40	not necessary
Euro OTC	Magnesium sulfat…	1109023-01	40	from supplier
Euro OTC	Magnesium trisil…	1012032-01	40	AR-13-FG-002912-01
Euro OTC	Nystatin	1712010-01	40	not necessary
Euro OTC	Nystatin	1612001-03	40	not necessary

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Supplier	Substance	Batch	Spectra	Certificate
Euro OTC	Nystatin	281103201	80	from supplier
Euro OTC	Potassium acetate	1112007	40	not necessary
Euro OTC	Potassium hydroc…	1004019-01	70	from supplier
Euro OTC	Potassium orotate	1203038V-02	60	not necessary
Euro OTC	Potassium orotate	1203038V-02	40	9757
Euro OTC	Potassium orotate	1203038V-02	40	not necessary
Euro OTC	Ropivacaine hydr…	1707006	40	20171013*
Euro OTC	Silica, colloida…	1101027-01	40	from supplier
Euro OTC	Sodium dihydroge…	1202015-01	40	not necessary
Euro OTC	Sodium molybdate…	L1305049-01	45	not necessary
Euro OTC	Sodium molybdate…	L2809007V-02	40	AR-13-FG-002915-01
Euro OTC	Sodium molybdate…	L1305049-01	60	not necessary
Euro OTC	Tricalcium phosp…	1206002-01	40	1402298
Euro OTC	Tricalcium phosp…	1009031-01	50	from supplier
Euro OTC	Zinc orotate dih…	1203014-01	40	1407431
Euro OTC	Zinc orotate dih…	13050005-02	40	not necessary
Euro OTC	Zinc orotate dih…	1203014-01	40	not necessary
Fagron	5-fluorouracil	13F19-N03	40	1402308
Fagron	5-fluorouracil	13F19-N03	60	1608169
Fagron	5-fluorouracil	09D28-N12	40	not necessary
Fagron	5-fluorouracil	16D01-U05/3-327376	40	not necessary
Fagron	8-quinolinol sul…	12H21-N08	40	not necessary
Fagron	8-quinolinol sul…	10F01-N15	40	AR-12-FG-009377-01
Fagron	Aluminium chlori…	12I27-N01	40	not necessary
Fagron	Aluminium potass…	12F25-N11	40	not necessary
Fagron	Aluminium potass…	10B01-N10	40	AR-12-FG-007570-01
Fagron	Amphetamine sulf…	15L01-B05-315291	20	1316Q-03361
Fagron	Amphetamine sulf…	16A29-B03-324577	40	2017B-03361
Fagron	Amphetamine sulf…	13G08-N11	20	0814K-03361
Fagron	Amphetamine sulf…	16A29-B03-324577	40	2017B-03361
Fagron	Amphetamine sulf…	15L01-B05-315291	20	1316Q-03361
Fagron	Barbital sodium	15L07-B02-324539	40	2017A-07775
Fagron	Barbital sodium	12F27-N02	20	0814I-07775
Fagron	Barbital sodium	14K14-B04-303353	20	1516I-07775
Fagron	Barbital sodium	15L07-B02-324539	40	2017A-07775
Fagron	Barbital sodium	14K14-B04-303353	20	1516I-07775
Fagron	Betaine hydrochl…	12A03-N08	40	not necessary
Fagron	Betaine hydrochl…	13H13-N02	40	1402684
Fagron	Betamethasone-17…	11I15-N02	40	not necessary
Fagron	Betamethasone-17…	11F22-N03	40	AR-13-FG-002911-01
Fagron	Betamethasone-17…	11G07IH	40	from supplier
Fagron	Bromelain	11A10-N10	40	not necessary
Fagron	Bromelain	14F20-B03295501	40	pending
Fagron	Bromelain	14F20-B03295501	60	not necessary
Fagron	Caffeine citrate	11F21-N05	40	not necessary
Fagron	Caffeine citrate	12C16-N03	40	1403477
Fagron	Caffeine citrate	15A05-B03-318006	40	not necessary
Fagron	Caffeine citrate	15A05-B03-302746	60	not necessary
Fagron	Caffeine citrate	15A05-B03-318006	40	not necessary
Fagron	Caffeine citrate	15A05-B03-302746	40	not necessary
Fagron	Calcium hydroxide	10L15-N07	30	not necessary
Fagron	Calcium hydroxide	13E22-N07	20	not necessary
Fagron	Chlorobutanol he…	14A06-B31-290310	60	1412458
Fagron	Cinchocaine hydr…	12F25-N10	40	1401148
Fagron	Cinchocaine hydr…	13G24-N05	40	not necessary
Fagron	Cinnarizine	13H01-N07	40	1402306
Fagron	Cinnarizine	11L22-N13	40	not necessary
Fagron	Cinnarizine	11L22-N13	40	not necessary
Fagron	Cinnarizine	14D09-B01-294702	60	AR-16-FG-008930-01
Fagron	Clobetasol-17-pr…	13E16-N01	40	not necessary

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Fagron	Cocaine hydrochl...	11G28-N11	80	not necessary
Fagron	Cocaine hydrochl...	11G15-N02	40	not necessary
Fagron	Cocaine hydrochl...	14H27-B03-304551	40	1917R-01278
Fagron	Cocaine hydrochl...	14H27-B03-304551	40	1917R-01278
Fagron	Cocaine hydrochl...	13I17-N02	20	0814I-01278
Fagron	Cocaine hydrochl...	16B11-B05-323386	40	1917Q-1278
Fagron	Cocaine hydrochl...	16B11-B05-323386	40	1917Q-1278
Fagron	Codeine monohydr...	12C05-N05	40	0814I-01280
Fagron	Codeine monohydr...	12C05-N05	60	0814I-01280
Fagron	Codeine phosphat...	15F09-B02-310520	20	1316Q-01279
Fagron	Codeine phosphat...	15F09-B02-310520	20	1316Q-01279
Fagron	Codeine phosphat...	16E17-B05-324109	40	2017A-01279
Fagron	Codeine phosphat...	13C11-N10	20	0814I-01279
Fagron	Copper orotate d...	09F15-N01	40	pending
Fagron	Copper orotate d...	CH-565313	40	pending
Fagron	Deoxycholic acid	14A02-B32-303429	40	not necessary
Fagron	Deoxycholic acid	14A02-B32-303429	60	AR-16-FG-004648-01
Fagron	Dexamethasone 1:...	11G08-N02	40	not necessary
Fagron	Dexamphetamine s...	13I23-N01	20	0814M-03582
Fagron	Dexamphetamine s...	16F09-B02-328352	40	2017A-03582
Fagron	Dexamphetamine s...	16F09-B02-328352	40	2017A-03582
Fagron	Dexamphetamine s...	15H06-B04-313862	20	1316Q-03582
Fagron	Dexamphetamine s...	16D20-B01-321049	40	2017B-03582
Fagron	Dexamphetamine s...	11F29N01	40	not necessary
Fagron	Dexamphetamine s...	15H06-B04-313862	20	1316Q-03582
Fagron	Dihydrocodeine h...	14K26-B04-306298	60	1516I-03065
Fagron	Dihydrocodeine h...	14K26-B04-306298	20	1516I-03065
Fagron	Dihydrocodeine h...	13H19-N03	20	0914C-03065
Fagron	Dihydrocodeine h...	15F18-B07-323388	40	2017A-03065
Fagron	Enalapril maleate	17J18-B03-347278	40	not necessary
Fagron	Enalapril maleate	16K14-B02-336220	40	1801425
Fagron	Ethyl hydrogen f...	14C12-B07-292760	60	1410436
Fagron	Ethyl hydrogen f...	14C12-B07-292760	60	not necessary
Fagron	Fentanyl citrate	13G30-N06	20	0814M-07678
Fagron	Fentanyl citrate	15F18-B01-525166	20	1316Q-03686
Fagron	Fentanyl citrate	15F18-B01-525098	20	1316R-03686
Fagron	Fentanyl citrate	16E26-B01-525360	40	2017A-03686
Fagron	Fentanyl citrate	4511E-07449	80	from supplier
Fagron	Fentanyl citrate	15F18-B01-525166	20	1316Q-03686
Fagron	Fentanyl citrate	16E26-B01-525360	40	2017A-03686
Fagron	Fentanyl citrate	11/19-N07	40	from supplier
Fagron	Fentanyl citrate	15F18-B01-525098	20	1316R-03686
Fagron	Fuchsine	11A05-N08	40	AR-12-FG-002852-01
Fagron	Glycopyrronium b...	16E09-B08-331027	40	1707615
Fagron	Glycopyrronium b...	16E09-B08-331027	40	not necessary
Fagron	Glycopyrronium b...	17D28-B04-341606	40	not necessary
Fagron	Heavy alkaline b...	11C10-N06	40	AR-13-FG-008124-01
Fagron	Hydromorphone hy...	13I25-N05	20	1516I-01334
Fagron	Hydromorphone hy...	13I25-N05	20	1516I-01334
Fagron	Hydromorphone hy...	13E16-N02	20	0914B-01334
Fagron	Hydromorphone hy...	15L08-B08-316877	40	1917Q-01334
Fagron	Indigo carmine	13K12-N01	40	1601099
Fagron	Indigo carmine	12C16-N04	40	1509365
Fagron	Lithium carbonate	08J06-N05	30	not necessary
Fagron	Macrogols 6000 p...	14J17-B01-309247	60	not necessary
Fagron	Macrogols 6000 p...	12A19-N02	40	AR-13-FG-008919-01
Fagron	Macrogols 6000 p...	14C11-B01-296014	60	not necessary
Fagron	Macrogols 6000 p...	14J17-B01-309247	60	AR-16-FG-011486-01
Fagron	Magnesium aspart...	17C21-B05-333111	40	not necessary
Fagron	Magnesium aspart...	15I24-B89-313231	60	not necessary

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Fagron	Magnesium aspart…	15I24-B89-313231	60	AR-16-FG-008660-03
Fagron	Methadone hydroc…	15E29-B02-313098	20	1516B-02949
Fagron	Methadone hydroc…	15E29-B02-313098	20	1516B-02949
Fagron	Methadone hydroc…	13J24-B06	20	0914F-02949
Fagron	Methadone hydroc…	16F24-B02-323183	40	1917Q-02949
Fagron	Methylrosanilini…	10A11-N12	40	not necessary
Fagron	Methylrosanilini…	13H28-N03	60	not necessary
Fagron	Methylrosanilini…	13G03-N11	40	not necessary
Fagron	Methylrosanilini…	12D19-N01	40	not necessary
Fagron	Methylrosanilini…	12D19-N01	40	1402202
Fagron	Methylrosanilini…	13H28-N03	60	AR-15-FG-004742-01
Fagron	Midazolam	16J03-B09-326963	30	1917Q-07393
Fagron	Midazolam	16J03-B09-326963	40	1917Q-07393
Fagron	Midazolam	13K05-N01	20	0914E-07393
Fagron	Midazolam	14C12-B31-313222	20	1516A-07393
Fagron	Midazolam	14C12-B31-313222	20	1516A-07393
Fagron	Midazolam hydroc…	15H04-B03-314396	30	1917R-03538
Fagron	Midazolam hydroc…	15J07-B01-320717	30	1917Q-03538
Fagron	Midazolam hydroc…	14L23-B04-300245	20	1516A-03538
Fagron	Midazolam hydroc…	14L23-B04-300245	20	1516A-03538
Fagron	Midazolam hydroc…	15J07-B01-320717	40	1917Q-03538
Fagron	Midazolam hydroc…	11F20-N01	80	from supplier
Fagron	Midazolam hydroc…	13E22-N09	20	0914F-03538
Fagron	Morphine hydroch…	16D21-B02-322088	40	1917Q-01879
Fagron	Morphine hydroch…	16D21-B02-322088	40	1917Q-01879
Fagron	Morphine hydroch…	15I09-B08-312694	20	1416Q-01879
Fagron	Morphine hydroch…	13G08-N04	20	0914G-01879
Fagron	Morphine hydroch…	15I09-B08-312694	20	1416Q-01879
Fagron	Morphine sulfate	14F02-B06-315405	40	1917Q-07776
Fagron	Morphine sulfate	13J07-N04	20	0914G-07776
Fagron	Morphine sulfate	14F02-B06-315405	40	1917Q-07776
Fagron	Nitrofurantoin	15J15-B06-315225	60	AR-16-FG-003763-01
Fagron	Nitrofurantoin	13B28-N07	40	not necessary
Fagron	Nitrofurantoin	12C30-N03	40	not necessary
Fagron	Nitrofurantoin	12C30-N03	40	1401461
Fagron	Nitrofurantoin	11K-21-N23	40	not necessary
Fagron	Nitrofurantoin	11I07-N11	40	not necessary
Fagron	Nitrofurantoin	15J15-B06-315225	60	not necessary
Fagron	Noscapine hydroc…	12D04-B04-284297	40	not necessary
Fagron	Nystatin	16L21-B01-338864	40	not necessary
Fagron	Phenobarbital	16G20-B04-328344	40	2017B-01040
Fagron	Phenobarbital	15G07-B06-311718	20	1416Q-01040
Fagron	Phenobarbital	16G20-B04-328344	40	2017B-01040
Fagron	Phenobarbital	15G07-B06-311718	20	1416Q-01040
Fagron	Prednisolone 1:1…	11L13-N06	40	AR-13-FG-000835-01
Fagron	Prednisolone 1:1…	09107-N09	40	not necessary
Fagron	Rutoside trihydr…	13K12-B06-295483	60	not necessary
Fagron	Rutoside trihydr…	11I20-N02	40	AR-13-FG-000836-01
Fagron	Salbutamol sulfate	13K12-N02	60	not necessary
Fagron	Salbutamol sulfate	13K12-N02	40	not necessary
Fagron	Salbutamol sulfate	13K12-N02	40	not necessary
Fagron	Salbutamol sulfate	13K12-N02	40	not necessary
Fagron	Salbutamol sulfate	13K12-N02	40	not necessary
Fagron	Salbutamol sulfate	13K12-N02	40	1801521
Fagron	Salbutamol sulfate	13K12-N02	40	not necessary
Fagron	Salbutamol sulfate	17I21-B02	40	not necessary
Fagron	Salbutamol sulfate	11L21-N10	40	AR-13-FG-001850-01
Fagron	Silbereiweiß	10F01-N13	50	not necessary
Fagron	Silver protein a…	18000970	40	not necessary
Fagron	Sodium alginate	14G22-B99-297091	60	not necessary

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Fagron	Sodium alginate	11K17-N12	40	AR-13-FG-002913-01
Fagron	Sodium hydroxide…	12E02-N15	80	not necessary
Fagron	Sodium monohydro…	11E02-N14	40	not necessary
Fagron	Sodium monohydro…	09K02-N05	40	not necessary
Fagron	Sodium thiosulfa…	11612-N16	40	AR-13-FG-005752-01
Fagron	Thiamine nitrate	15A30-B06-309069	60	AR-16-FG-005855-01
Fagron	Thiomersal	11K01-N03	40	1401417
Fagron	Triamcinolone ac…	08K26-N05	40	from supplier
Fagron	Zinc orotate dih…	11K16-N10	40	not necessary
Fagron	Zinc orotate dih…	13J08-N05	40	not necessary
Galke	Abrotani herb, cut	21340	40	not necessary
Galke	Acorus root, pee…	19657	40	not necessary
Galke	Blackberry leaf,…	18060	40	not necessary
Galke	Boldo leaf, cut	19855	40	not necessary
Galke	Fraxinella root,…	17805	40	not necessary
Galke	Hawthorn leaf wi…	21126	40	not necessary
Galke	Juniper	19174	40	not necessary
Galke	Liqourice root, …	22728	40	from supplier
Galke	Marshmallow root…	14073	40	not necessary
Galke	Maté leaf, cut	21684	40	from supplier
Galke	Matricaria flower	22684	40	not necessary
Galke	Melissa leaf, cut	22218	40	from supplier
Galke	Nettle leaf, cut	21238	40	from supplier
Galke	Nettle seed	21186	40	pending
Galke	Peppermint leaf,…	19537	40	not necessary
Galke	Peppermint leaf,…	20244	40	not necessary
Galke	Silverweed, cut	22840	40	not necessary
Galke	Thyme, rubbed	21932	40	not necessary
Gatt-Koller	Caffeine citrate	1783/05140715	60	AR-15-FG-014994-01
Gatt-Koller	Caffeine citrate	4065/11164916	40	not necessary
GoCaps	Gelatine capsules	650-004	37	AR-12-FG-010178-01
Gonmisol	Lutein 20% powder	20120320	40	not necessary
Gustav-G. Die…	Chondroitin sulf…	zu erfassen	40	AR-14-FG-001918-01
inalc	D-ribose	P19/28/069	20	not necessary
Inresa	Baclofen	206031617/09062017	40	AR-17-FG-018577-01
Inresa	Ketoprofen	F1300182	60	not necessary
Inresa	Ketoprofen	F1300183	60	AR-15-FG-009572-01
Inresa	Maltodextrin	R1503902	60	AR-15-FG-008821-01
Inresa	Maltodextrin	R1600014	60	not necessary
Inresa	Sotalol hydrochl…	369-MC	40	not necessary
iphas	Cellulose capsules	53099151	37	not necessary
Kaden Biochem…	Antioxidant tea …	0809	40	not necessary
Kaden Biochem…	Quercetin	0608	40	not necessary
Kaden Biochem…	Rhodiola rosea e…	1009	40	not necessary
Kaden Biochem…	Rhodiola rosea e…	1009	40	pending
Katwijk Chemi…	Ethosuximide	451644	40	not necessary
Katwijk Chemi…	Ethosuximide	451645	40	20180426
Katwijk Chemi…	Ethosuximide	451717	40	not necessary
Klenk	Abrotani herb, cut	3451B110207	40	not necessary
Klenk	Agarikon	1061A120312	40	pending
Klenk	Agnus castus fruit	7110N090701	40	pending
Klenk	Almonds, bitter,…	0040A111117	40	not necessary
Klenk	Ammi visnaga fruit	7120A120112	40	not necessary
Klenk	Angelica root	6085B120614	60	1509356
Klenk	Angelica root	6085B120614	40	not necessary
Klenk	Aniseed	2700A110701	40	not necessary
Klenk	Aniseed	2700A140129	60	not necessary
Klenk	Aniseed	2700A160511	60	1708049
Klenk	Ash bark, cut	0871B110127	60	not necessary
Klenk	Asparagus root, …	6151B110304	40	1403480

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Klenk	Asplenium scolop…	4451B100520	40	not necessary
Klenk	Barberries	2720N111109	40	1405127
Klenk	Barberry root ba…	0551B100706	40	not necessary
Klenk	Basil, rubbed	3632A110201	40	not necessary
Klenk	Bean shells, cut	067A100817	40	from supplier
Klenk	Birch bark, cut	0561A121121	40	not necessary
Klenk	Bitter fennel	2880N120418	40	1412547
Klenk	Bitter fennel	2860A140613	60	AR-15-FG-008160-01
Klenk	Bitter fennel	2880N120418	40	AR-15-FG-002805-02
Klenk	Bitter fennel	zu erfassen	40	AR-12-FG-007350-01
Klenk	Bitter orange pe…	zu erfassen	40	not necessary
Klenk	Black cumin seed	7330A110204	40	not necessary
Klenk	Black mustard seed	7430A120813	40	AR-15-FG-001050-01
Klenk	Black mustard se…	7434A120712	40	AR-15-FG-006711-01
Klenk	Blackthorn flowe…	1150N101109	40	not necessary
Klenk	Blessed thistle,…	3691A110517	40	not necessary
Klenk	Bogbean leaf, cut	2371B100616	40	AR-12-FG-007208-01
Klenk	Boldo leaf, cut	1911A100714	40	not necessary
Klenk	Buckwheat seed	7510A111011	40	from supplier
Klenk	Buckwheat seed	7510A111011	60	pending
Klenk	Calendula flower	1241B130321	40	not necessary
Klenk	Calendula flower…	1241B110118	40	from supplier
Klenk	Calendula flower…	1241A100816	40	not necessary
Klenk	Caraway fruit	2770A110601	40	pending
Klenk	Caraway fruit	2770A100413	40	not necessary
Klenk	Caraway fruit	2770A110601	40	pending
Klenk	Caraway fruit	2770A110601	40	pending
Klenk	Cardamom, excort…	2765A130524	60	AR-15-FG-015285-01
Klenk	Celery fruit	7140A131122	60	not necessary
Klenk	Celery fruit	7140A111013	40	not necessary
Klenk	Celery fruit	7140A130625	40	1405177
Klenk	Celery root, cut	6091N081016	40	pending
Klenk	Celery root, cut	6091A110110	40	1410177
Klenk	Ceylon cinnamon,…	0614B120504	40	1403047
Klenk	Ceylon cinnamon,…	0614B120504	40	not necessary
Klenk	Chelidonium maju…	3731K120904	40	not necessary
Klenk	Cherry stems, cut	5591A100913	40	1402575
Klenk	Chervil, rubbed	3721A100329	40	not necessary
Klenk	Chicory herb, cut	3751A100118	40	not necessary
Klenk	Chicory root, cut	6221A101202	40	from supplier
Klenk	Cleavers goosegr…	4731B110809	40	not necessary
Klenk	Clove	1260A150916	40	1708050
Klenk	Clove	1260A110608	40	not necessary
Klenk	Clove, powdered …	1264B141007	60	AR-15-FG-014858-01
Klenk	Cocoa bark, cut	0571N101012	40	not necessary
Klenk	Coltsfoot leaf, …	2021B111005	40	not necessary
Klenk	Comfrey herb, cut	4561B100518	60	not necessary
Klenk	Comfrey root	6244B130624	40	not necessary
Klenk	Comfrey root	6241A090616	70	F 2010 000 067
Klenk	Cottonwood bud, …	3266B150624	60	not necessary
Klenk	Cottonwood bud, …	3266B101208	40	not necessary
Klenk	Cottonwood bud, …	3266B130826	40	1410178
Klenk	Cumin, powdered	2824B121001	40	not necessary
Klenk	Dandelion root, …	6621B151029	60	AR-17-FG-007535-01
Klenk	Dandelion root, …	6621A100510	40	not necessary
Klenk	Devil's claw root	6334B110706	40	from supplier
Klenk	Dill fruit	2680A170222	60	not necessary
Klenk	Dill fruit	2680A110808	40	not necessary
Klenk	Dill fruit	zu erfassen	40	not necessary
Klenk	Elder berries	3010A120202	40	pending

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Klenk	Elder leaf, cut	2321B130221	60	not necessary
Klenk	Elder root, cut	6281B110427	40	not necessary
Klenk	Elecampane rhizo…	6341B120611	40	not necessary
Klenk	Euphrasy herb, cut	3871B100713	40	not necessary
Klenk	European golden …	1781B110706	40	not necessary
Klenk	Fenugreek, powde…	7264B130205	40	1408080
Klenk	Fenugreek, powde…	7264A151001	60	AR-16-FG-014493-01
Klenk	Frangula bark, cut	0661B110412	40	not necessary
Klenk	Galeopsis herb, …	3911A090219	40	not necessary
Klenk	Ginger, peeled	6951B100302	60	not necessary
Klenk	Ginger, peeled, …	6954B160429	60	1704440
Klenk	Ginger, peeled, …	6554B100409	40	AR-12-FG-008593-01
Klenk	Ginger, peeled, …	6954B170127	60	1708675
Klenk	Ginger, peeled, …	6954B140724	60	AR-15-FG-014915-01
Klenk	Ginger, peeled, …	6954B150325	60	1606616
Klenk	Goat's rue, cut	3901C110905	40	not necessary
Klenk	Greek mountain h…	4511K130314	40	not necessary
Klenk	Green tea	5100A100611	40	not necessary
Klenk	Ground ivy herb,…	3991B110304	40	not necessary
Klenk	Hawthorn flower	zu erfassen	40	not necessary
Klenk	Hawthorn leaf wi…	1971A110125	45	not necessary
Klenk	Hawthorn leaf wi…	1971A100830	40	not necessary
Klenk	Hay flower	1400A130304	40	not necessary
Klenk	Hay flower	1400A120116	40	not necessary
Klenk	Horse chestnut f…	1441B100616	40	not necessary
Klenk	Ispaghula seed	7560A120330	40	1403467
Klenk	Java tea, cut	2221B101213	40	not necessary
Klenk	Java tea, cut	2221B110718	40	not necessary
Klenk	Juniper	2890A100120	40	not necessary
Klenk	Juniper, powdered	2894B100531	40	pending
Klenk	Juniper, powdered	2894B150922	60	1704439
Klenk	Juniper, powdered	2894B130320	40	1411362
Klenk	Knotgrass, cut	4301A120912	40	not necessary
Klenk	Ladys bedstraw …	3921B091126	40	not necessary
Klenk	Ladys bedstraw …	3921B101012	40	not necessary
Klenk	Ladys bedstraw …	3921B101012	40	not necessary
Klenk	Laurel leaf, cut	2121B101209	40	not necessary
Klenk	Laurel leaf, cut	2121B110809	40	not necessary
Klenk	Laurel leaf, pow…	2124A110329	40	1411032
Klenk	Laurel leaf, pow…	2124A110329	40	not necessary
Klenk	Laurel leaf, pow…	2124A110329	60	not necessary
Klenk	Laurel seed	2900N100517	75	not necessary
Klenk	Lavender flower	1489A120103	40	not necessary
Klenk	Lavender flower	06120	40	from supplier
Klenk	Lavender flower	1489A120103	40	from supplier
Klenk	Lime leaf, cut	2471B110126	40	not necessary
Klenk	Linseed	7308A100705	40	not necessary
Klenk	Lovage root, cut	6371A080508	40	AR-12-FG-008337-01
Klenk	Mace, powdered (…	5214A090716	50	pending
Klenk	Maize style, cut	5581A111206	40	not necessary
Klenk	Male speedwell w…	4661B101011	40	not necessary
Klenk	Male speedwell w…	4661B101011	40	not necessary
Klenk	Mallow leaf, cut	2131B110420	40	not necessary
Klenk	Mallow leaf, cut	2131B101014	50	not necessary
Klenk	Marian thistle h…	3701A111207	40	not necessary
Klenk	Marian thistle h…	3701B110610	40	not necessary
Klenk	Marian thistle h…	3701A100916	40	not necessary
Klenk	Marshmallow root…	6074B100416	40	not necessary
Klenk	Marshmallow root…	6071A100210	40	not necessary
Klenk	Marshmallow root…	zu erfassen	40	not necessary

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Supplier	Substance	Batch	Spectra	Certificate
Klenk	Meadowsweet herb…	4541A120313	60	not necessary
Klenk	Melissa leaf, cut	2161A090630	130	not necessary
Klenk	Melissa leaf, cut	2161A121029	55	not necessary
Klenk	Melissa leaf, cut	2161A101216	40	not necessary
Klenk	Motherwort herb,…	4071A121211	40	not necessary
Klenk	Myrrh	3355B120628	40	AR-15-FG-000945-01
Klenk	Nettle leaf, cut	2381A110913	40	not necessary
Klenk	Nettle root, cut	6631B100211	40	from supplier
Klenk	Nettle root, cut	6631B120416	40	not necessary
Klenk	Nettle seed	7470A111117	35	pending
Klenk	Nettle seed	7470A110418	40	not necessary
Klenk	Nutmeg	7320A121002	40	not necessary
Klenk	Nutmeg, powdered…	7325A160405	60	9888
Klenk	Olive leaf	211A080311	40	AR-12-FG-008663-01
Klenk	Orange peel, cut	0531A091125	40	not necessary
Klenk	Oregano herb	4221A100628	40	not necessary
Klenk	Oregano herb	4221N111011	40	not necessary
Klenk	Parsley herb, ru…	4262A091116	60	not necessary
Klenk	Parsley root, cut	6441A110210	40	not necessary
Klenk	Parsley seed	7370A130909	40	1407600
Klenk	Parsley seed	7370A091120	40	not necessary
Klenk	Passionflower he…	4231A120329	40	not necessary
Klenk	Passionflower he…	4231A100705	49	from supplier
Klenk	Passionflower he…	4231B080508	30	from supplier
Klenk	Peony root, cut	6421B120327	60	not necessary
Klenk	Peony root, cut	6421B090625	40	from supplier
Klenk	Peppermint leaf,…	2181A110512	40	not necessary
Klenk	Peppermint leaf,…	2181A101013	40	not necessary
Klenk	Peppermint leaf,…	zu erfassen	20	not necessary
Klenk	Peppermint leaf,…	2181A100323	40	not necessary
Klenk	Primrose root, cut	6461A100511	40	not necessary
Klenk	Primrose root, cut	6461N100203	40	from supplier
Klenk	Red clover flower	1640A100120	40	not necessary
Klenk	Red clover flower	1640A100120	40	not necessary
Klenk	Red poppy petals…	1531B090126	40	not necessary
Klenk	Restharrow root,…	6411B130404	40	not necessary
Klenk	Ribwort plantain…	4271A100615	40	not necessary
Klenk	Rose hips seed	7240A120402	60	not necessary
Klenk	Rose hips with p…	2841B111019	40	not necessary
Klenk	Rosemary leaf, cut	2261A131118	60	AR-15-FG-008499-01
Klenk	Ruscus rhizome, …	7081B110301	60	not necessary
Klenk	Saffron (spice)	0384A121022	40	not necessary
Klenk	Sage leaf, cut	2301A100209	30	not necessary
Klenk	Sage leaf, cut	2301A100208	40	not necessary
Klenk	Sage leaf, cut	2301A100209	40	not necessary
Klenk	Sage leaf, cut	2301A110420	40	not necessary
Klenk	Sanicle herb, cut	4391B110411	50	from supplier
Klenk	Saponaria herb, …	4411A090915	40	not necessary
Klenk	Senna leaf, powd…	2334B090306	50	pending
Klenk	Senna leaf, powd…	2334B130606	60	AR-15-FG-015212-01
Klenk	Senna leaf, powd…	2334B110207	40	pending
Klenk	St. John's wort,…	4021A100315	20	not necessary
Klenk	St. John's wort,…	4021A100819	50	not necessary
Klenk	Stemless carline…	6194B091028	50	from supplier
Klenk	Strawberry leaf,…	2031B110224	40	not necessary
Klenk	Strawberry leaf,…	2031B120925	40	not necessary
Klenk	Strawberry leaf,…	2031B110224	40	not necessary
Klenk	Sunflower, cut	1701B100902	40	not necessary
Klenk	Sweet fennel	2870A130304	40	1405154
Klenk	Sweet fennel	2870A110412	40	pending

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Supplier	Substance	Batch	Spectra	Certificate
Klenk	Tall hawkweed, cut	3611B111005	40	not necessary
Klenk	Theriac, powdered	13816	60	1705088
Klenk	Thyme, rubbed	4622A110728	40	not necessary
Klenk	Tonka beans	1030A110704	40	not necessary
Klenk	Tormentil	6911B141114	60	AR-15-FG-014020-01
Klenk	Tormentil	6914B120112	40	not necessary
Klenk	Turmeric root, cut	6741A110202	40	AR-12-FG-008355-01
Klenk	Verbena herb, cut	4651B120611	40	not necessary
Klenk	Vine leaf, cut	2491B100707	40	not necessary
Klenk	White mustard se...	7254A110823	40	1403282
Klenk	White mustard se...	7254A110823	40	not necessary
Klenk	Wild pansy, cut	4681B100624	40	not necessary
Klenk	Wild pansy, cut	4681B100624	40	not necessary
Klenk	Wild pansy, cut	4681A100621	40	not necessary
Klenk	Willow bark, cut	0811B100910	40	not necessary
Klenk	Willowherb, smal...	4721A140203	60	not necessary
Klenk	Willowherb, smal...	4721A101010	40	not necessary
Klenk	Willowherb, smal...	4721A101010	40	not necessary
Klenk	Yarrow herb, cut	4181A111122	40	not necessary
Klenk	Yarrow herb, cut	4181A111122	40	not necessary
Klenk	Yarrow herb, cut	4181A111122	40	not necessary
Klenk	Yarrow herb, cut	4181A091111	60	not necessary
Klenk	Zedoary root, po...	6944B080904	50	pending
Kräuter Schulte	Albizia julibris...	42681	40	from supplier
Kräuter Schulte	Anemarrhena root...	37601	30	from supplier
Kräuter Schulte	Angelica root	53855	40	pending
Kräuter Schulte	Angelica root	46957	40	pending
Kräuter Schulte	Angelica root	48123	40	not necessary
Kräuter Schulte	Aniseed	51600	40	not necessary
Kräuter Schulte	Black cumin seed	50371	40	not necessary
Kräuter Schulte	Caraway fruit	53193	40	pending
Kräuter Schulte	China Pai Mu Tan	54071	40	from supplier
Kräuter Schulte	Dryas octopetala...	38970	39	from supplier
Kräuter Schulte	Feverfew herb, cut	54169	40	from supplier
Kräuter Schulte	Geum urbanum her...	52944	40	from supplier
Kräuter Schulte	Grassleaf sweetf...	32477	40	from supplier
Kräuter Schulte	Hawthorn leaf wi...	52923	40	from supplier
Kräuter Schulte	Liquorice root, ...	48219	40	not necessary
Kräuter Schulte	Long-stamen chive	50126	40	pending
Kräuter Schulte	Long-stamen chive	10445	40	pending
Kräuter Schulte	Marian thistle f...	53673	40	from supplier
Kräuter Schulte	Marshmallow root...	46559	40	from supplier
Kräuter Schulte	Moroccan mint, cut	44201	40	pending
Kräuter Schulte	Red tea	52029	40	pending
Kräuter Schulte	Ribwort plantain...	47935	40	from supplier
Kräuter Schulte	Saponaria root, ...	53638	40	from supplier
Kräuter Schulte	Thyme, rubbed	47177	40	not necessary
Kräuter Schulte	Twotoothed achyr...	42168	40	pending
Kräuter Schulte	Twotoothed achyr...	45053	40	not necessary
Kräuter Schulte	Water plantain r...	52179	40	from supplier
Kräuter Schulte	White mustard seed	52071	40	1408078
Kräuter Schulte	Wild apple, sweet	53182	40	not necessary
Kräuter Schulte	Zedoary root, cut	53227	40	not necessary
Kreatin.de GmbH	Creatine	300331	50	1405615
Lycored corp.	Caromix	CMX-LLCV-011401	40	not necessary
Lycored corp.	Caromix	CMX-PL-101112	40	not necessary
Merck KGaA	Benzoyl peroxide...	S7012241509	60	pending
Merck KGaA	Caesium carbonate	K36017440634	40	from supplier
mikroChem	D-(+)-mannose	A-04052011/R3878	40	not necessary
MP Biomedicals	Sulfanilamide	M3567	40	1402054

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Supplier	Substance	Batch	Spectra	Certificate
New Zealand P…	Deoxycholic acid	0411656	40	AR-12-FG-009964-01
New Zealand P…	Deoxycholic acid	0411656	40	not necessary
Otto Fischar	Talcum	90841/1	40	from supplier
Pharmorgana	L-carnitine tart…	1000160672	40	not necessary
Pharmorgana	Potassium orotate	1000070227	40	AR-12-FG-009684-01
Pharmorgana	Sodium dichloroa…	1000150016	40	from supplier
Pharmorgana	Zinc orotate dih…	1000127154	40	not necessary
Phytochem	D-ribose	zu erfassen	60	not necessary
Phytochem	D-ribose	zu erfassen	40	not necessary
Roth	Brilliant blue R…	314217301	60	from supplier
Roth	Deoxycholic acid…	154212633	60	not necessary
Roth	Deoxycholic acid…	084181622	40	1405618
Roth	Deoxycholic acid…	351172090	40	not necessary
Roth	Deoxycholic acid…	385212633	60	not necessary
Roth	Esculin	155206581	60	pending
Roth	Theobromine, 99%	145191010	60	AR-16-FG-002141-01
Roth	Theobromine, 99%	365191010	60	not necessary
Roth	Trypan blue (C.I…	204209355	60	from supplier
Safic-Alcan	Amygdalin	11082101	40	from supplier
Safic-Alcan	Amygdalin, bitte…	BAE150902	20	from supplier
Safic-Alcan	Amygdalin, bitte…	BAE150902	20	from supplier
Safic-Alcan	Cowberry extract…	17320/01	40	AR-12-FG-008822-01
Sanacorp	Yarrow herb, cut	11280503	40	from supplier
Sand 12 GmbH	D-ribose	L201211720	40	not necessary
sanherb	Griffonia seed e…	G-S100915	40	from supplier
Sigma-Aldrich	Bromelain	BCBM1589V	40	not necessary
Sigma-Aldrich	Bromothymol blue	MKBQ5404V	40	pending
softline	Maltodextrin	940PLV-643	40	not necessary
Spinnrad	Emulsan II SP	111300063	40	from supplier
Spinnrad	Inulin	1112300433	40	not necessary
Spinnrad	Inulin	2013481819	30	not necessary
Th. Geyer	Amphetamine sulf…	67002	20	0814I-03361
Th. Geyer	Amphetamine sulf…	67002	40	not necessary
Th. Geyer	Amphetamine sulf…	067043	40	2017C-03361
Th. Geyer	Amphetamine sulf…	067043	40	2017C-03361
Th. Geyer	Barbital sodium	60508	80	not necessary
Th. Geyer	Barbital sodium	60508	40	not available
Th. Geyer	Calcium colamine…	260EXP1016	40	from supplier
Th. Geyer	Calcium colamine…	33299	20	from supplier
Th. Geyer	Calcium colamine…	260EXP1016	40	from supplier
Th. Geyer	Cocaine hydrochl…	60145	20	0814K-01278
Th. Geyer	Codeine phosphat…	067054	40	2017D-01279
Th. Geyer	Codeine phosphat…	067054	40	2017D-01279
Th. Geyer	Codeine phosphat…	67038	20	0814K-01279
Th. Geyer	Dihydrocodeine h…	67035	20	0914D-03065
Th. Geyer	Dihydrocodeine h…	067052	40	2017D-03065
Th. Geyer	Methadone hydroc…	067055	40	1917S-02949
Th. Geyer	Methadone hydroc…	067055	40	1917S-02949
Th. Geyer	Methadone hydroc…	67047	20	0914H-02949
Th. Geyer	Methadone hydroc…	67033	20	0914G-02949
Th. Geyer	Mg-Ca-K colamine…	117EXP1016	40	from supplier
Th. Geyer	Mg-Ca-K colamine…	117EXP1016	40	from supplier
Th. Geyer	Mg-Ca-K colamine…	54610	40	not necessary
Th. Geyer	Mg-Ca-K colamine…	54610	40	from supplier
Th. Geyer	Mg-Ca-K colamine…	36985	20	from supplier
Th. Geyer	Morphine hydroch…	67036	20	0914H-01879
Th. Geyer	Morphine hydroch…	56311	40	not necessary
Th. Geyer	Phenobarbital	067056	40	2017A-01040
Th. Geyer	Phenobarbital	67045	20	0914F-01040
Vitatene	Betanat® 10% CWD	400101E10	40	not necessary

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Supplier	Substance	Batch	Spectra	Certificate
Vitaworld	D-(+)-mannose	5449324	40	not necessary
VMP Chemiekon...	D-(+)-glucosamin...	144212943	40	20140402
Wellmune	1.25-beta-glucan	10176-021	40	not necessary
pending	Bromothymol blue	zu erfassen	40	not necessary
pending	Chicory root, cut	zu erfassen	20	not necessary
pending	Common broom her...	zu erfassen	40	not necessary
pending	Dandelion herb w...	zu erfassen	40	not necessary
pending	Kaolin, heavy	zu erfassen	50	not necessary
pending	Magnesium sulfat...	zu erfassen	40	not necessary
pending	Male speedwell w...	zu erfassen	40	not necessary
pending	Melissa leaf, cut	zu erfassen	45	not necessary
pending	Potassium monohy...	zu erfassen	40	not necessary
pending	Sage leaf, cut	zu erfassen	40	not necessary
pending	Sodium butyrate	zu erfassen	40	not necessary
pending	Sodium proprionate	zu erfassen	40	not necessary
pending	Sodium thiosulfa...	zu erfassen	40	AR-13-FG-001882-01
pending	Tragacanth, powd...	zu erfassen	40	not necessary

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

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Appendix C: Additional validation samples (*Type C*)

Spectra for substances from the field which cannot be identified with this model also enter the validation. In this manner, it is verified that the model also rejects unknown substances. The spectra for these samples were recorded by *Apo-Ident* customers. They belong to *Type C*. The information provided by the customer regarding the manufacturer and batch number is taken over by *HiperScan GmbH* to a large extent unchecked.

The samples originate from 8686 batches. From these, 21 386 spectra were recorded. The spectra recorded on independent samples of substances from the field which can be identified with the model are listed respectively in the section *Type C* for the individual substances and do not appear again elsewhere in this list.

Supplier	Substance	Batch	Spectra
A.H. 27.05.13 ek: 6,75EUR	Male speedwell wort, ...	274239	1
AHD	Bitter fennel	15006502	1
AHD	Sodium hydrogen carbo...	1208008-01	13
AHD	Sodium monohydrogenph...	112345013	1
AHD	Tragacanth, powdered	15379906	2
AHD 10.02.17 EK.3,50	Aniseed	16200801	1
Akazie	Black cumin seed	20.09.2015	1
Akazie	Cinnamon, cut	20.09.2015	1
Akazie	Dill fruit	20.09.2015	1
Akazie	Linseed	20.09.2015	2
Akazie	Rosemary leaf, cut	20.09.2015	1
Akazien-Apo	Cinnamon, cut	Test	1
Aldrich	Sodium proprionate	U02796-056	1
Alfred Galke	Alchemilla, cut	20921	1
Alfred Galke	Bitter fennel	18270	1
Alfred Galke	Caraway fruit	20069	1
Alfred Galke	Melissa leaf, cut	D-NI-1-9516-BC	1
Alfred Galke	Raspberry leaf, cut	19851	1
Alfred Galke	Shepherd's purse, cut	20591	1
Alfred Galke	Yarrow herb, cut	19861	1
Alliance	Hawthorn flower	13010403	1
Alliance	Heather, cut	255389	1
Alliance	Robert herb, cut	3951A110621	6
Alliance	Sodium monohydrogenph...	12256606	1
Alliance Health	Aluminium potassium s...	13025401	3
Alliance healthcare	Sodium monohydrogenph...	12L05-N04	2
Alliance Healthcare	Aluminium potassium s...	13025404	1
Allianz Healthcare	Pumpkin seed, peeled	16081210	1
Alte Apotheke	Oak bark, cut	15314904	2
an	Blessed thistle, cut	13389704	1
an	Gentian root, cut	6311b130305	1
an	Hawthorn leaf with fl...	1971A130930	2
an	Passionflower herb, cut	13141212	1
an	Raspberry leaf, cut	13086708	1
an	Roselle	14018101	1
an	Verbena herb, cut	12383007	1
Anzag	Acorus root, natural,...	276260	3
Anzag	Aluminium potassium s...	1218441	1
Anzag	Angelica root	12168703	3
Anzag	Blessed thistle, cut	282281	1
Anzag	Blessed thistle, cut	271946	1
Anzag	Calendula flower, cut	12221706	17
Anzag	Centaury, cut	2727897	1
Anzag	Cowberry extract 6:1	20206/01	1
Anzag	Damiana leaf, cut	11026606	1
Anzag	Dandelion herb with r...	274030	1

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Supplier	Substance	Batch	Spectra
Anzag	Ispaghula seed	11185818	1
Anzag	Lavender flower	1488A12803	1
Anzag	Lime flower, cut	7120	1
Anzag	Linseed	12137105	1
Anzag	Liqourice root, peeled	272896	1
Anzag	Magnesium chloride he…	1304003-01	2
Anzag	Magnesium chloride he…	120802501	1
Anzag	Magnesium chloride he…	111201301	1
Anzag	Maize style, cut	274920	1
Anzag	Marian thistle fruit	11126702	12
Anzag	Marshmallow root, pee…	11126702	1
Anzag	Meadowsweet herb, cut	10381602	5
Anzag	Mullein flower, cut	11020714	5
Anzag	Nettle leaf, cut	2381-A130122	1
Anzag	Nystatin	2902041-02	1
Anzag	Passionflower herb, cut	1207211669	1
Anzag	Ramsons herb, cut	11182207	2
Anzag	Robert herb, cut	11147806	1
Anzag	Star anise	10376403	6
Anzag	Sweet woodruff herb, …	12103504	2
Anzag	Trichloroacetic acid	12135204	5
Anzag	Walnut bark, cut	711B110128	3
Anzag	White deadnettle herb…	11010606	1
Anzag	Yarrow herb, cut	11306307	1
Anzag 05.10.2012	Coltsfoot leaf, cut	121005	2
Anzag 06.04.2016	Aniseed	15398601	1
Anzag 07.11.12	Liqourice root, peeled	11034018	1
Anzag 07.11.12 ek: 2,48	Aluminium potassium s…	12184402	5
Anzag 10.05 2010	Hawthorn leaf with fl…	1910E-01485	1
Anzag 10.05.13 ek:3,16EUR	Dandelion herb with r…	6611B130321	1
Anzag 11.09.2012	Calcium hydroxide	112F08-N02	1
Anzag 12.03.13 ek: 4,…	St. John's wort, cut	11185608	2
Anzag 12.11.12 ek:11,04	Lime flower, cut	1611B120827	14
Anzag 12.11.12 ek:3,85	Yarrow herb, cut	11280513	1
Anzag 13,02.13 ek: 4,…	Magnesium sulfate, dr…	11265910	1
Anzag 13.12.12 ek: 5,…	Calendula flower, cut	1241C120321	5
Anzag 14.03.13 ek:6,60EUR	Marshmallow root, pee…	6071A130116	12
Anzag 17.04.13 ek: 2,…	Tall golden rod, cut	4521A110816	2
Anzag 17.07.2012	Dithranol	APDT/365/2011D	3
Anzag 19.09.2012	White mustard seed, p…	11114409	2
Anzag 22.03.13 ek: 5,…	Aloes, cape, powdered	12232102	1
Anzag 25.10.12 ek:3.16EUR	Dandelion herb with r…	6611B110131	1
Anzag 26.02.13 ek: 10…	Willowherb, small flo…	4721C120321	17
Anzag 26.10.12 2.36EUR	Oak bark, cut	10348616	7
Anzag 27.12.12 ek:2,79	Blackberry leaf, cut	10136048	1
Anzag 28.08.2012	Bilberry fruit, dried	10273712	2
Anzag 28.08.2012	Daisy flower	11068306	1
Anzag 28.08.2012	Dandelion root, cut	11003311	3
Anzag 29.04.13 ek: 4,…	Magnesium sulfate hep…	12138518	4
Anzag 6.03.13 ek: 13.…	Matricaria flower	12244805	5
anzag 8.8.13	Nettle leaf, cut	12183901	3
Anzag am 05.05.2012	Marshmallow root, pee…	11101809	2
ANZAG am 06.06.2012	Rosemary leaf, cut	268132	4
Anzag am 08.05.2012	Aluminium chloride he…	12C07-N01	17
Anzag am 08.05.2012	Motherwort herb, cut	10244612	1
ANZAG am 15.05.2012	Aluminium potassium s…	1108049-01	4
ANZAG am 15.05.2012	Ladys bedstraw herb,…	10375704	2
ANZAG am 22.05.2012	Aluminium potassium s…	12022401	2
ANZAG am 22.05.2012	Raspberry leaf, cut	2291A111124	3
ANZAG am 23.05.2012	Calcium hydrogen phos…	10135228	2

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Supplier	Substance	Batch	Spectra
ANZAG am 23.05.2012	Common wormwood herb,...	11286301	1
ANZAG am 23.05.2012	Potassium hydrocarbon...	11105811	4
ANZAG am 23.05.2012	Rosemary leaf, cut	2261A100916	1
Anzag am 24.04.2012	Fumitory, cut	3881B100127	3
Anzag am 24.05.2012	Sodium hydrogen carbo...	11E31-N04	1
Anzag ek: 2,59EUR 19.09...	Caraway fruit	11003216	4
Anzag ek: 4,58EUR 25.09...	Walnut leaf, cut	2111A120123	9
Anzag ek: 4,88EUR 26.09...	Male speedwell wort, ...	4661C120321	11
Anzag ek: 6,39 11,09...	Alchemilla, cut	11182806	9
Anzag ek:2,64EUR 16.07.12	Mistletoe, cut	10273417	1
Anzag ek:3,13EUR 15.09.12	Melilot herb, cut	11307605	5
Anzag ek:8.77EUR 30.08.12	Manna, cut	11308904	5
Anzag EK7,91 08.08.12	Gentian root, cut	10263407	1
Anzag, 18.05.2012	Birch leaf, cut	259195	1
Anzag, 18.07.2012	Yarrow herb, cut	11106405	1
Anzag, 24.10.2012	Yarrow herb, cut	270116	2
anzag, 31.10.2012	Lavender flower		1
anzag,26.11.12	Ammonium hydrogen car...	12022308	5
Anzag/	Dithranol	APDT3652011	1
Anzag/	Robert herb, cut	11147813	5
Apofit	Blue bottle flower wi...	278776	1
Apofit	Fenugreek	222392	1
ApoFit/Noweda	Walnut leaf, cut	271137	1
Apomix	Trichloroacetic acid	12G04-M11	1
Apomix / 11	Carbachol	12330703	1
apomix/Phönix	Oak bark, cut	9357419	2
Apotheke Bühlau	Almonds, bitter, whole	267467	2
Apotheke Bühlau	Horse chestnut leaf, ...	100416	1
Audor Pharma	Dithranol	ApDt/365/2011D	1
Audor Pharma	Dithranol	DT/365/2011D	1
Audor Pharma	Dithranol	APDT/351/2010D	1
Audor Pharma	Dithranol	APDT3752012D	3
Audor Pharma	Dithranol	APDT/365/2011/	1
Audor Pharma	Dithranol	APDT3902013D	1
Audor Pharma	Dithranol	APDT/386/2012D	1
Audor Pharma	Dithranol	DT/351/2010D	1
Audor Pharma	Dithranol	APDT/365/2011	4
Audor Pharma	Nystatin	AP11K11-N04N	1
Audor Pharma	Nystatin	11C07-N05N	1
Audor Pharma	Nystatin	AP11G07-N12N	1
Aurica	Aniseed	521302895	1
Aurica	Birch leaf, cut	521205644	1
Aurica	Common wormwood herb,...	521305386	1
Aurica	Dandelion herb with r...	521200197	1
Aurica	Equisetum stem, cut	521205308	1
Aurica	Nettle leaf, cut	224131	1
Aurica	Passionflower herb, cut	521300655	1
Aurica	Red clover flower	521203442	1
Aurica	Red clover flower	521206331	1
Aurica	Rose hips with peel, ...	521201801	1
Aurica	Sage leaf, cut	521204613	1
Aurica	St. John's wort, cut	521202559	1
Aurica	St. John's wort, cut	521200778	1
Aurica	Tall golden rod, cut	224133	2
Aurica	Tall golden rod, cut	521201267	1
Aurica	Thyme, rubbed	521207003	1
Aurica	Valerian root, cut	221838	2
Aurica	Verbena herb, cut	521305668	1
Aurica / 11	Equisetum stem, cut	521302898	1
Aurica / 11	Juniper	521301390	1

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Supplier	Substance	Batch	Spectra
Aurica / 11	Primrose flower	521301234	1
Aurica Naturheilmitte…	Aniseed, powdered	521405796	1
Aurica Naturheilmitte…	Aniseed	521600679	1
Aurica/ Noweda	St. John's wort, cut	521305424	1
Aurica/ Sanacorp	Thyme, rubbed	521301852	1
Aurica/ Vedono	Peppermint leaf, cut	521301217	1
Aurica/Anzag	Red clover flower	521303918	1
Aurica/Gehe	Primrose flower	521203308	1
aurica/phoenix	Liquorice root, natur…	521206925	1
Aurica/Phönix	Acorus root, peeled	150649	1
Aurica/Phönix	Angelica root	520800638	1
Aurica/Phönix	Bean shells, cut	5052301	1
Aurica/Phönix	Centaury, cut	520702152	1
Aurica/Phönix	Juniper	521006043	1
Aurica/Phönix	Maize style, cut	520901387	1
Aurica/Phönix	Male speedwell wort, …	520708362	1
Aurica/Phönix	Mistletoe, cut	6110801	1
Bahnhof-Apotheke	Acorus root, peeled	17-121107	1
Bahnhof-Apotheke	Alchemilla, cut	17-121107	1
Bahnhof-Apotheke	Aniseed	7-120913	1
Bahnhof-Apotheke	Birch leaf, cut	18-120702	1
Bahnhof-Apotheke	Bitter fennel	11-121029	1
Bahnhof-Apotheke	Blackberry leaf, cut	18-120702	1
Bahnhof-Apotheke	Calendula flower, cut	17-121106	1
Bahnhof-Apotheke	Caraway fruit	18-120709	1
Bahnhof-Apotheke	Elder flower, rubbed	17-121112	1
Bahnhof-Apotheke	Hawthorn leaf with fl…	7-121011	1
Bahnhof-Apotheke	Hay flower	13-121105	1
Bahnhof-Apotheke	Lime flower, cut	7-121011	1
Bahnhof-Apotheke	Liqourice root, peeled	17-121112	1
Bahnhof-Apotheke	Lycopodium herb, cut	17-121112	1
Bahnhof-Apotheke	Maize style, cut	20-121018	1
Bahnhof-Apotheke	Male speedwell wort, …	4-121002	1
Bahnhof-Apotheke	Matricaria flower	11-121024	1
Bahnhof-Apotheke	Melissa leaf, cut	17-120917	1
Bahnhof-Apotheke	Nettle leaf, cut	7-121109	1
Bahnhof-Apotheke	Oak bark, cut	17-121106	1
Bahnhof-Apotheke	Psyllium seed	3-121005	1
Bahnhof-Apotheke	Raspberry leaf, cut	17-120917	1
Bahnhof-Apotheke	Ribwort plantain, cut	7-121011	1
Bahnhof-Apotheke	Rosemary leaf, cut	7-120915	1
Bahnhof-Apotheke	Sage leaf, cut	3-121018	1
Bahnhof-Apotheke	Shepherd's purse, cut	4-120924	1
Bahnhof-Apotheke	St. John's wort, cut	4-121018	1
Bahnhof-Apotheke	Thyme, rubbed	17-121112	1
Bahnhof-Apotheke	Willowherb, small flo…	17-121107	1
Bahnhof-Apotheke	Wormwood herb, cut	17-121107	1
Bahnhof-Apotheke	Yarrow herb, cut	7-121011	1
Berco	Maltodextrin	los945-3	1
Berkel AHK	Agnus castus fruit	14194401	2
Berkel AHK	Aniseed	14110202	1
Berkel AHK	Aniseed	13333912	4
Berkel AHK	Aniseed	13333907	11
Berkel AHK	Aniseed	13333902	11
Berkel AHK	Aniseed	11374103	2
Berkel AHK	Aniseed	14194401	1
Berkel AHK	Caraway fruit	13397103	2
Berkel AHK	Oak bark, cut	13360310	1
Berkel AHK	Oak bark, cut	13011905	1
Berkel AHK	Oak bark, cut	13360303	5

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Supplier	Substance	Batch	Spectra
Berkel AHK	Valerian root, powdered	19196802	1
Berkel AHK	Valerian root, powdered	13287406	1
Berkel AHK	Valerian root, powdered	14179403	2
BimSiframGroup	Amygdalin	STA130512002	2
BimSiframGroup	Amygdalin	141120	1
BimSiframGroup	Amygdalin	13121802	2
Biogenerics	Amygdalin	NSIH03040	1
BLS	Phenobarbital	67056	1
Bomastus-Werke/Phönix	Rosemary leaf, cut	298424	2
Bomba/AHD	Coltsfoot leaf, cut	276303	6
Bomba/AHD	Equisetum stem, cut	280449	4
Bomba/AHD	Senna leaf, cut	280008	3
Bomba/AHD	Tall golden rod, cut	279526	1
Bomba/AHD	Willow bark, cut	280362	1
Bombaltus	Hop strobile	274724	1
Bombastus	Acorus root, natural,...	277958	1
Bombastus	Acorus root, natural,...	281692	1
Bombastus	Acorus root, natural,...	282476	1
Bombastus	Acorus root, natural,...	224114	1
Bombastus	Acorus root, natural,...	271667	1
Bombastus	Acorus root, natural,...	274159	1
Bombastus	Acorus root, natural,...	273214	1
Bombastus	Acorus root, peeled	267365	1
Bombastus	Acorus root, peeled	269479	2
Bombastus	Acorus root, peeled	274159	3
Bombastus	Acorus root, peeled	271667	1
Bombastus	Alchemilla alpina her...	278889	1
Bombastus	Alchemilla, cut	521203995	1
Bombastus	Alchemilla, cut	279070	6
Bombastus	Alchemilla, cut	268287	1
Bombastus	Alchemilla, cut	282032	2
Bombastus	Alchemilla, cut	14066007	1
Bombastus	Alchemilla, cut	231013B	1
Bombastus	Alchemilla, cut	272021	6
Bombastus	Alchemilla, cut	263194	1
Bombastus	Alchemilla, cut	276173	4
Bombastus	Alchemilla, cut	264972	2
Bombastus	Alchemilla, cut	266404	1
Bombastus	Alchemilla, cut	278889	3
Bombastus	Almonds, bitter, whole	290973	4
Bombastus	Almonds, bitter, whole	284978	1
Bombastus	Almonds, bitter, whole	283369	1
Bombastus	Almonds, bitter, whole	275600	1
Bombastus	Almonds, bitter, whole	275001	3
Bombastus	Almonds, bitter, whole	305322	1
Bombastus	Almonds, bitter, whole	303218	2
Bombastus	Almonds, bitter, whole	275601	1
Bombastus	Almonds, bitter, whole	267529	1
Bombastus	Angelica root	272895	1
Bombastus	Angelica root	277310	4
Bombastus	Angelica root	272954	4
Bombastus	Angelica root	275878	1
Bombastus	Angelica root	305460	1
Bombastus	Angelica root	270117	2
Bombastus	Angelica root	275879	1
Bombastus	Angelica root	285732	2
Bombastus	Angelica root	281280	8
Bombastus	Angelica root	283387	1
Bombastus	Angelica root	301768	1
Bombastus	Angelica root	301767	1

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Supplier	Substance	Batch	Spectra
Bombastus	Angelica root	307041	1
Bombastus	Angelica root	295085	2
Bombastus	Angelica root	291848	1
Bombastus	Angelica root	284545	1
Bombastus	Angelica root	290309	1
Bombastus	Angelica root	278294	1
Bombastus	Angelica root	218280	1
Bombastus	Aniseed	273682	2
Bombastus	Aniseed	268180	1
Bombastus	Aniseed	278925	2
Bombastus	Aniseed	289846	1
Bombastus	Aniseed	285778	2
Bombastus	Aniseed	276456	1
Bombastus	Aniseed	285777	1
Bombastus	Aniseed	305177	1
Bombastus	Aniseed	282917	2
Bombastus	Arnica flower	271581	2
Bombastus	Arnica flower	271668	1
Bombastus	Arnica flower	280672	1
Bombastus	Artichoke leaf, cut	8202213593	1
Bombastus	Bean shells, cut	240503	1
Bombastus	Bean shells, cut	282475	1
Bombastus	Bean shells, cut	278686	1
Bombastus	Bean shells, cut	272781	5
Bombastus	Bean shells, cut	270517	2
Bombastus	Bean shells, cut	278696	3
Bombastus	Bearberry leaf, cut	272297	8
Bombastus	Bearberry leaf, cut	275491	3
Bombastus	Bilberry leaf, cut	273581	2
Bombastus	Bilberry leaf, cut	283170	1
Bombastus	Bilberry leaf, cut	272176	3
Bombastus	Birch leaf, cut	267077	2
Bombastus	Birch leaf, cut	269195	1
Bombastus	Birch leaf, cut	287280	1
Bombastus	Birch leaf, cut	270743	1
Bombastus	Birch leaf, cut	272385	1
Bombastus	Birch leaf, cut	274498	1
Bombastus	Birch leaf, cut	274499	2
Bombastus	Birch leaf, cut	277822	2
Bombastus	Birch leaf, cut	278316	1
Bombastus	Birch leaf, cut	280677	1
Bombastus	Birch leaf, cut	266623	2
Bombastus	Bitter fennel	289870	1
Bombastus	Bitter fennel	280891	2
Bombastus	Bitter fennel	275922	5
Bombastus	Bitter fennel	275921	1
Bombastus	Bitter fennel	273706	5
Bombastus	Bitter fennel	268130	4
Bombastus	Bitter fennel	299385	2
Bombastus	Bitter fennel	289870	2
Bombastus	Bitter fennel	293627	1
Bombastus	Bitter fennel	289869	1
Bombastus	Bitter fennel	285609	1
Bombastus	Bitter fennel	267683	1
Bombastus	Bitter fennel	296877	1
Bombastus	Bitter orange peel, cut	278233	4
Bombastus	Bitter orange peel, cut	267364	1
Bombastus	Bitter orange peel, cut	274240	5
Bombastus	Blackberry leaf, cut	267122	3
Bombastus	Blackberry leaf, cut	273668	3

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Supplier	Substance	Batch	Spectra
Bombastus	Blackberry leaf, cut	261490	1
Bombastus	Blue bottle flower wi…	284030	1
Bombastus	Blue bottle flower wi…	275759	2
Bombastus	Calendula flower	268626	1
Bombastus	Calendula flower	279632	1
Bombastus	Calendula flower	280306	2
Bombastus	Calendula flower, cut	279632	1
Bombastus	Calendula flower, cut	234997	1
Bombastus	Calendula flower, cut	207294	1
Bombastus	Calendula flower, cut	253620	1
Bombastus	Calendula flower, cut	270046	5
Bombastus	Calendula flower, cut	275128	1
Bombastus	Calendula flower, cut	275813	1
Bombastus	Calendula flower, cut	261332	1
Bombastus	Caraway fruit	270278	1
Bombastus	Caraway fruit	277491	2
Bombastus	Caraway fruit	275849	2
Bombastus	Caraway fruit	270124	1
Bombastus	Caraway fruit	272730	1
Bombastus	Caraway fruit	275228	1
Bombastus	Caraway fruit	282269	1
Bombastus	Centaury, cut	277598	3
Bombastus	Centaury, cut	281951	1
Bombastus	Centaury, cut	262982	2
Bombastus	Coltsfoot leaf, cut	265856	1
Bombastus	Coltsfoot leaf, cut	274289	6
Bombastus	Coltsfoot leaf, cut	266999	1
Bombastus	Coltsfoot leaf, cut	277848	2
Bombastus	Coltsfoot leaf, cut	26693	1
Bombastus	Coltsfoot leaf, cut	232339	1
Bombastus	Coltsfoot leaf, cut	275489	3
Bombastus	Coltsfoot leaf, cut	269501	5
Bombastus	Coltsfoot leaf, cut	285263	3
Bombastus	Coltsfoot leaf, cut	281100	4
Bombastus	Coltsfoot leaf, cut	278758	7
Bombastus	Coltsfoot leaf, cut	272019	1
Bombastus	Coltsfoot leaf, cut	266691	2
Bombastus	Coltsfoot leaf, cut	277131	1
Bombastus	Comfrey herb, cut	281531	1
Bombastus	Coriander	263733	1
Bombastus	Couch grass rhizome, …	262175	1
Bombastus	Couch grass rhizome, …	276777	4
Bombastus	Couch grass rhizome, …	273387	4
Bombastus	Couch grass rhizome, …	270500	2
Bombastus	Couch grass rhizome, …	269196	1
Bombastus	Dandelion herb with r…	258809	1
Bombastus	Dandelion herb with r…	290125	1
Bombastus	Dandelion herb with r…	285264	1
Bombastus	Dandelion herb with r…	282916	7
Bombastus	Dandelion herb with r…	275126	3
Bombastus	Dandelion herb with r…	271272	5
Bombastus	Dandelion herb with r…	280363-3385310110	1
Bombastus	Dandelion herb with r…	274030	4
Bombastus	Dandelion herb with r…	264967	1
Bombastus	Dandelion herb with r…	280363	6
Bombastus	Dandelion herb with r…	277597	8
Bombastus	Dandelion herb withou…	11371906	2
Bombastus	Dandelion herb withou…	11371901	1
Bombastus	Dill herb, cut	50836505	1
Bombastus	Elder flower, rubbed	279216	9

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Supplier	Substance	Batch	Spectra
Bombastus	Elder flower, rubbed	265631	1
Bombastus	Elder flower, rubbed	275393	5
Bombastus	Elder flower, rubbed	269873	3
Bombastus	Equisetum stem, cut	280647	1
Bombastus	Equisetum stem, cut	268321	1
Bombastus	Equisetum stem, cut	266865	1
Bombastus	Equisetum stem, cut	264100	1
Bombastus	Equisetum stem, cut	264101	1
Bombastus	Equisetum stem, cut	6011401	1
Bombastus	Equisetum stem, cut	279133	2
Bombastus	Equisetum stem, cut	278107	1
Bombastus	Equisetum stem, cut	18111304	1
Bombastus	Equisetum stem, cut	265924	1
Bombastus	Equisetum stem, cut	275891	3
Bombastus	Equisetum stem, cut	275836	2
Bombastus	Equisetum stem, cut	274714	1
Bombastus	Equisetum stem, cut	268534	2
Bombastus	Equisetum stem, cut	269031	2
Bombastus	Equisetum stem, cut	274168	1
Bombastus	Equisetum stem, cut	272552	3
Bombastus	Equisetum stem, cut	273963	2
Bombastus	Euphrasy herb, cut	278108	2
Bombastus	Euphrasy herb, cut	277846	1
Bombastus	Euphrasy herb, cut	274553	1
Bombastus	Frangula bark, cut	238812	1
Bombastus	Frangula bark, cut	275998	4
Bombastus	Frangula bark, cut	281284	2
Bombastus	Frangula bark, cut	278599	4
Bombastus	Frangula bark, cut	273926	1
Bombastus	Frangula bark, cut	249091	2
Bombastus	Frangula bark, cut	268407	4
Bombastus	Frangula bark, cut	270733	1
Bombastus	Ginseng root	13150903	1
Bombastus	Hawthorn leaf with fl…	275309	3
Bombastus	Hawthorn leaf with fl…	282220	1
Bombastus	Hawthorn leaf with fl…	272881	1
Bombastus	Hawthorn leaf with fl…	272177	1
Bombastus	Hawthorn leaf with fl…	267000	1
Bombastus	Hawthorn leaf with fl…	273287	1
Bombastus	Hawthorn leaf with fl…	275310	2
Bombastus	Hawthorn leaf with fl…	267551	1
Bombastus	Hawthorn leaf with fl…	264044	1
Bombastus	Hawthorn leaf with fl…	267551	2
Bombastus	Hawthorn leaf with fl…	265197	2
Bombastus	Hawthorn leaf with fl…	278756	1
Bombastus	Heather, cut	278314	2
Bombastus	Hop strobile	277821	2
Bombastus	Hop strobile	10240403	1
Bombastus	Hop strobile	208502	1
Bombastus	Hop strobile	271870	2
Bombastus	Hop strobile	276976	1
Bombastus	Iceland moss, cut	13357802	1
Bombastus	Iceland moss, cut	12187108	4
Bombastus	Ladys bedstraw herb,…	3921B120130	1
Bombastus	Lavender flower	279213	1
Bombastus	Lavender flower	276799	2
Bombastus	Lavender flower	274469	1
Bombastus	Lavender flower	268831	2
Bombastus	Lime flower, cut	281042	1
Bombastus	Lime flower, cut	280678	3

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Supplier	Substance	Batch	Spectra
Bombastus	Lime flower, cut	275129	3
Bombastus	Lime flower, cut	267693	1
Bombastus	Lime flower, cut	276813	1
Bombastus	Lime flower, cut	266863	1
Bombastus	Lime flower, cut	268477	2
Bombastus	Lime flower, cut	25091205	1
Bombastus	Linseed	1610	1
Bombastus	Linseed	282734	3
Bombastus	Linseed	295376	1
Bombastus	Linseed	278457	6
Bombastus	Linseed	269500	1
Bombastus	Linseed	274032	1
Bombastus	Liqourice root, peeled	268001	1
Bombastus	Liqourice root, peeled	270192	1
Bombastus	Liqourice root, peeled	270853	5
Bombastus	Liquorice root, natur…	267852	2
Bombastus	Liquorice root, natur…	3713Q2151	1
Bombastus	Liquorice root, natur…	2901312151	1
Bombastus	Liquorice root, natur…	286584	1
Bombastus	Liquorice root, natur…	285185	2
Bombastus	Liquorice root, natur…	284243	3
Bombastus	Liquorice root, natur…	279409	3
Bombastus	Liquorice root, natur…	278377	5
Bombastus	Liquorice root, natur…	276468	7
Bombastus	Liquorice root, natur…	5091305	1
Bombastus	Liquorice root, natur…	903312151	1
Bombastus	Liquorice root, natur…	274921	4
Bombastus	Lovage root, cut	273001	1
Bombastus	Lovage root, cut	260409	1
Bombastus	Magnesium sulfate hep…	274794	1
Bombastus	Magnesium sulfate hep…	277424	1
Bombastus	Maize style, cut	271033	1
Bombastus	Maize style, cut	285912	1
Bombastus	Maize style, cut	276776	1
Bombastus	Maize style, cut	81113a	1
Bombastus	Maize style, cut	282574	3
Bombastus	Male speedwell wort, …	278855	2
Bombastus	Male speedwell wort, …	274238	2
Bombastus	Male speedwell wort, …	269497	2
Bombastus	Male speedwell wort, …	268409	1
Bombastus	Male speedwell wort, …	265564	1
Bombastus	Mallow flower, cut	13267304	1
Bombastus	Mallow leaf, cut	273803	1
Bombastus	Mallow leaf, cut	278925	2
Bombastus	Mallow leaf, cut	267168	3
Bombastus	Mallow leaf, cut	272034	2
Bombastus	Marian thistle fruit	279405	3
Bombastus	Marian thistle fruit	272575	1
Bombastus	Marian thistle fruit	269499	1
Bombastus	Marian thistle fruit	268192	1
Bombastus	Marian thistle fruit	13122013a	1
Bombastus	Marian thistle fruit	262426	1
Bombastus	Marian thistle fruit	278379	1
Bombastus	Marian thistle fruit	277720	3
Bombastus	Marian thistle fruit	278378	1
Bombastus	Marian thistle fruit	284420	1
Bombastus	Marian thistle fruit	296193	1
Bombastus	Marian thistle fruit	296535	1
Bombastus	Marian thistle fruit	299483	1
Bombastus	Marian thistle fruit	7180A110209	4

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Supplier	Substance	Batch	Spectra
Bombastus	Marian thistle fruit	282034	2
Bombastus	Marshmallow root, nat…	270467	1
Bombastus	Marshmallow root, nat…	272130	2
Bombastus	Marshmallow root, pee…	273458	1
Bombastus	Matricaria flower	268408	3
Bombastus	Matricaria flower	264997	1
Bombastus	Matricaria flower	270579	4
Bombastus	Matricaria flower	266864	1
Bombastus	Matricaria flower	278414	2
Bombastus	Matricaria flower	271781	5
Bombastus	Matricaria flower	287855	1
Bombastus	Matricaria flower	277997	2
Bombastus	Matricaria flower	277959	7
Bombastus	Matricaria flower	276307	1
Bombastus	Matricaria flower	299185	1
Bombastus	Matricaria flower	262364	2
Bombastus	Matricaria flower	280143	2
Bombastus	Matricaria flower	274870	2
Bombastus	Matricaria flower	274106	3
Bombastus	Matricaria flower	274105	1
Bombastus	Matricaria flower	273667	2
Bombastus	Matricaria flower	273388	3
Bombastus	Matricaria flower	283710	2
Bombastus	Matricaria flower	268712	1
Bombastus	Melissa leaf, cut	276579	1
Bombastus	Melissa leaf, cut	273485	3
Bombastus	Melissa leaf, cut	273483	2
Bombastus	Melissa leaf, cut	277722	2
Bombastus	Melissa leaf, cut	266341	1
Bombastus	Melissa leaf, cut	271499	3
Bombastus	Melissa leaf, cut	270044	2
Bombastus	Melissa leaf, cut	261988	1
Bombastus	Methadone hydrochloride	13266507	2
Bombastus	Methadone hydrochloride	14C24-B01-292858	6
Bombastus	Mistletoe, cut	265420	1
Bombastus	Mistletoe, cut	271782	5
Bombastus	Mistletoe, cut	261875	2
Bombastus	Mistletoe, cut	276155	2
Bombastus	Mistletoe, cut	277432	2
Bombastus	Nettle leaf, cut	267854	1
Bombastus	Nettle leaf, cut	266638	1
Bombastus	Nettle leaf, cut	255763	1
Bombastus	Nettle leaf, cut	266099	1
Bombastus	Nettle leaf, cut	260739	1
Bombastus	Nettle leaf, cut	270987	4
Bombastus	Nettle leaf, cut	275763	4
Bombastus	Nettle leaf, cut	273229	2
Bombastus	Nettle leaf, cut	275848	3
Bombastus	Nettle leaf, cut	272303	3
Bombastus	Nettle leaf, cut	277950	4
Bombastus	Nettle leaf, cut	270854	6
Bombastus	Nettle leaf, cut	280305	2
Bombastus	Nystatin	12158022	2
Bombastus	Oak bark, cut	272704	2
Bombastus	Oak bark, cut	279525	2
Bombastus	Oak bark, cut	265717	1
Bombastus	Oak bark, cut	229090	1
Bombastus	Oak bark, cut	286297	1
Bombastus	Oak bark, cut	285327	3
Bombastus	Oak bark, cut	274611	3

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Supplier	Substance	Batch	Spectra
Bombastus	Oak bark, cut	274392	3
Bombastus	Oak bark, cut	264301	2
Bombastus	Olive leaf	Unbekannt	1
Bombastus	Peppermint leaf, cut	276172	1
Bombastus	Peppermint leaf, cut	278585	1
Bombastus	Peppermint leaf, cut	274021	2
Bombastus	Peppermint leaf, cut	271499	1
Bombastus	Peppermint leaf, cut	281282	3
Bombastus	Peppermint leaf, cut	281043	4
Bombastus	Peppermint leaf, cut	279914	2
Bombastus	Peppermint leaf, cut	275295	4
Bombastus	Peppermint leaf, cut	273843	2
Bombastus	Peppermint leaf, cut	278201	2
Bombastus	Peppermint leaf, cut	279634	2
Bombastus	Peppermint leaf, cut	285914	1
Bombastus	Peppermint leaf, cut	279214	1
Bombastus	Peppermint leaf, cut	275492	1
Bombastus	Peppermint leaf, cut	246514	1
Bombastus	Peppermint leaf, cut	282509	1
Bombastus	Peppermint leaf, cut	255719	1
Bombastus	Peppermint leaf, cut	270270	1
Bombastus	Peppermint leaf, cut	267998	4
Bombastus	Peppermint leaf, cut	268379	2
Bombastus	Peppermint leaf, cut	272295	1
Bombastus	Peppermint leaf, cut	272956	6
Bombastus	Peppermint leaf, cut	278679	3
Bombastus	Peppermint leaf, cut	266772	2
Bombastus	Raspberry leaf, cut	263050	6
Bombastus	Raspberry leaf, cut	274507	1
Bombastus	Raspberry leaf, cut	262836	2
Bombastus	Raspberry leaf, cut	273143	2
Bombastus	Raspberry leaf, cut	272898	1
Bombastus	Raspberry leaf, cut	269870	1
Bombastus	Raspberry leaf, cut	267122	1
Bombastus	Raspberry leaf, cut	273710	7
Bombastus	Raspberry leaf, cut	273668	4
Bombastus	Raspberry leaf, cut	279686	3
Bombastus	Raspberry leaf, cut	265844	1
Bombastus	Raspberry leaf, cut	248586	1
Bombastus	Raspberry leaf, cut	273778	1
Bombastus	Raspberry leaf, cut	267998	1
Bombastus	Restharrow root, cut	274421	3
Bombastus	Restharrow root, cut	283708	1
Bombastus	Rhubarb, powdered	11043806	1
Bombastus	Ribwort plantain, cut	276453	1
Bombastus	Ribwort plantain, cut	278038	1
Bombastus	Ribwort plantain, cut	275479	5
Bombastus	Ribwort plantain, cut	279569	1
Bombastus	Ribwort plantain, cut	263401	2
Bombastus	Ribwort plantain, cut	270016	4
Bombastus	Rose hips peel, cut	277431	3
Bombastus	Rose hips peel, cut	231013A	1
Bombastus	Rose hips peel, cut	283458	1
Bombastus	Rose hips peel, cut	285184	1
Bombastus	Rose hips peel, cut	257166	1
Bombastus	Rose hips peel, cut	269033	1
Bombastus	Rosemary leaf, cut	270171	1
Bombastus	Rosemary leaf, cut	281843	2
Bombastus	Rosemary leaf, cut	281248	1
Bombastus	Rosemary leaf, cut	277128	2

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Supplier	Substance	Batch	Spectra
Bombastus	Rosemary leaf, cut	272435	2
Bombastus	Sage leaf, cut	279929	6
Bombastus	Sage leaf, cut	264390	1
Bombastus	Sage leaf, cut	275330	2
Bombastus	Sage leaf, cut	271253	1
Bombastus	Sage leaf, cut	255381	1
Bombastus	Sage leaf, cut	270115	1
Bombastus	Sage leaf, cut	277512	1
Bombastus	Senna leaf, cut	273474	1
Bombastus	Senna leaf, cut	273547	3
Bombastus	Senna leaf, cut	275285	3
Bombastus	Senna leaf, cut	271828	1
Bombastus	Senna leaf, cut	266901	1
Bombastus	Senna leaf, cut	280448	2
Bombastus	Senna leaf, cut	280581	2
Bombastus	Senna leaf, cut	278109	1
Bombastus	Senna leaf, cut	277575	4
Bombastus	Shepherd's purse, cut	12345	2
Bombastus	Shepherd's purse, cut	262668	1
Bombastus	Shepherd's purse, cut	284136	1
Bombastus	Shepherd's purse, cut	278856	3
Bombastus	Shepherd's purse, cut	269594	6
Bombastus	Shepherd's purse, cut	269977	1
Bombastus	Sodium monohydrogenph…	11H04-N06	1
Bombastus	St. John's wort, cut	275106	7
Bombastus	St. John's wort, cut	265761	1
Bombastus	St. John's wort, cut	268834	2
Bombastus	St. John's wort, cut	281530	2
Bombastus	St. John's wort, cut	268834	3
Bombastus	Tall golden rod, cut	209974	1
Bombastus	Tall golden rod, cut	261756	1
Bombastus	Tall golden rod, cut	269563	2
Bombastus	Tall golden rod, cut	270047	5
Bombastus	Tall golden rod, cut	271459	1
Bombastus	Tall golden rod, cut	271460	1
Bombastus	Tall golden rod, cut	274290	4
Bombastus	Tall golden rod, cut	278697	5
Bombastus	Thyme, rubbed	275877	1
Bombastus	Thyme, rubbed	277996	3
Bombastus	Thyme, rubbed	268912	1
Bombastus	Thyme, rubbed	267394	1
Bombastus	Thyme, rubbed	243485	1
Bombastus	Thyme, rubbed	280782	1
Bombastus	Thyme, rubbed	278309	2
Bombastus	Thyme, rubbed	277466	1
Bombastus	Thyme, rubbed	276508	2
Bombastus	Turmeric, javanese, cut	262792	1
Bombastus	Turmeric, javanese, cut	284242	2
Bombastus	Turmeric, javanese, cut	282221	2
Bombastus	Turmeric, javanese, cut	277130	1
Bombastus	Valerian root, cut	267863	1
Bombastus	Valerian root, cut	268057	1
Bombastus	Valerian root, cut	268458	3
Bombastus	Valerian root, cut	269457	1
Bombastus	Valerian root, cut	274722	1
Bombastus	Valerian root, cut	276645	2
Bombastus	Valerian root, cut	6641B110317	3
Bombastus	Valerian root, cut	274561	1
Bombastus	Walnut bark, cut	711B1206130	1
Bombastus	Walnut leaf, cut	267575	1

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Supplier	Substance	Batch	Spectra
Bombastus	Wild pansy, cut	278106	1
Bombastus	Wild pansy, cut	270869	2
Bombastus	Wild pansy, cut	27132	1
Bombastus	Wild pansy, cut	272832	2
Bombastus	Wild pansy, cut	274237	2
Bombastus	Wild pansy, cut	276259	4
Bombastus	Wild pansy, cut	282661	1
Bombastus	Wild pansy, cut	280890	1
Bombastus	Wild pansy, cut	279314	3
Bombastus	Wild pansy, cut	220232	1
Bombastus	Willow bark, cut	261615	1
Bombastus	Willow bark, cut	282270	3
Bombastus	Willow bark, cut	251385	1
Bombastus	Willow bark, cut	265845	1
Bombastus	Willow bark, cut	288869	1
Bombastus	Willow bark, cut	161594	1
Bombastus	Willow bark, cut	277847	1
Bombastus	Willow bark, cut	270886	2
Bombastus	Willow bark, cut	278458	3
Bombastus	Willow bark, cut	292710	1
Bombastus	Willow bark, cut	275052	1
Bombastus	Willow bark, cut	267927	1
Bombastus	Willow bark, cut	277005	4
Bombastus	Willow bark, cut	281533	2
Bombastus	Willowherb, small flo…	278235	1
Bombastus	Willowherb, small flo…	281846	2
Bombastus	Willowherb, small flo…	268836	3
Bombastus	Willowherb, small flo…	259546	2
Bombastus	Wormwood herb, cut	221868	1
Bombastus	Wormwood herb, cut	281000	1
Bombastus	Wormwood herb, cut	265417	3
Bombastus	Yarrow herb, cut	274284	3
Bombastus	Yarrow herb, cut	15006702	2
Bombastus	Yarrow herb, cut	278315	5
Bombastus	Yarrow herb, cut	273273	2
Bombastus	Yarrow herb, cut	268179	2
Bombastus	Yarrow herb, cut	279023	4
Bombastus	Yarrow herb, cut	276498	4
Bombastus	Yarrow herb, cut	274610	2
Bombastus	Yarrow herb, cut	275964	1
Bombastus	Yarrow herb, cut	277430	2
Caaelo	Sodium sulfate decahy…	11294603	2
Cae	Bean shells, cut	Int.Ch.313011	1
Cae	Bilberry fruit, dried	212172	1
Cae	Bitter fennel	Int.Ch.314090	1
Caelo	Abrotani herb, cut	2091305	1
Caelo	Acorus root, natural,…	12066501	1
Caelo	Acorus root, natural,…	13127801	1
Caelo	Acorus root, natural,…	284875	2
Caelo	Acorus root, peeled	2913M-02173	1
Caelo	Acorus root, peeled	28121205	1
Caelo	Acorus root, peeled	241013010	1
Caelo	Acorus root, peeled	24081203	1
Caelo	Acorus root, peeled	2211a-02173	1
Caelo	Acorus root, peeled	18011301	1
Caelo	Acorus root, peeled	313060	1
Caelo	Acorus root, peeled	12239008	1
Caelo	Acorus root, peeled	12295904	4
Caelo	Acorus root, peeled	12275604-3544411013	1
Caelo	Acorus root, peeled	7061302	1

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Supplier	Substance	Batch	Spectra
Caelo	Acorus root, peeled	8031306	1
Caelo	Acorus root, peeled	11054204	1
Caelo	Acorus root, peeled	12056701	2
Caelo	Acorus root, peeled	12056703	2
Caelo	Acorus root, peeled	12056704	1
Caelo	Acorus root, peeled	13101306	1
Caelo	Acorus root, peeled	12066501	8
Caelo	Acorus root, peeled	12275602	7
Caelo	Acorus root, peeled	12275604	2
Caelo	Acorus root, peeled	12295901	3
Caelo	Acorus root, peeled	15061202	1
Caelo	Acorus root, peeled	12056702	1
Caelo	Acorus root, peeled	11054205	1
Caelo	Acorus root, peeled	12295902	4
Caelo	Acorus root, peeled	12295903	1
Caelo	Acorus root, peeled	12066502	2
Caelo	Agarikon	11024502	1
Caelo	Agnus castus fruit	12016903	1
Caelo	Agnus castus fruit	12016908	1
Caelo	Agnus castus fruit	12274013	2
Caelo	Agnus castus fruit	nachprüfung	1
Caelo	Agnus castus fruit	14194408	1
Caelo	Agnus castus fruit	15065105	1
Caelo	Agnus castus fruit	80175158	2
Caelo	Agnus castus fruit	15318702	1
Caelo	Agnus castus fruit	15318718	1
Caelo	Agnus castus fruit	13193406	3
Caelo	Agnus castus fruit	13193404	1
Caelo	Agnus castus fruit	1513546	1
Caelo	Agnus castus fruit	11026309	1
Caelo	Agnus castus fruit	11026318	1
Caelo	Agnus castus fruit	12016904	1
Caelo	Agnus castus fruit	12016907	1
Caelo	Agnus castus fruit	12016909	4
Caelo	Agnus castus fruit	12274001	1
Caelo	Agnus castus fruit	12274002	1
Caelo	Agnus castus fruit	12274003	7
Caelo	Agnus castus fruit	12274009	2
Caelo	Agnus castus fruit	12274010	11
Caelo	Agnus castus fruit	12274012	1
Caelo	Agnus castus fruit	12274014	1
Caelo	Agnus castus fruit	13193403	1
Caelo	Agnus castus fruit	15065102	2
Caelo	Agnus castus fruit	3413A-03015	1
Caelo	Agnus castus fruit	12016905	2
Caelo	Agnus castus fruit	13193410	2
Caelo	Agnus castus fruit	13193401	2
Caelo	Agrimony, cut	11374004	8
Caelo	Agrimony, cut	12382901	3
Caelo	Agrimony, cut	12382903	1
Caelo	Agrimony, cut	21081205	1
Caelo	Agrimony, cut	3481-A-110324	1
Caelo	Agrimony, cut	10325504	1
Caelo	Agrimony, cut	10325501	1
Caelo	Agrimony, cut	10325505	2
Caelo	Agrimony, cut	11374005	2
Caelo	Agrimony, cut	12382905	6
Caelo	Agrimony, cut	10325502	2
Caelo	Agrimony, cut	11374006	9
Caelo	Agrimony, cut	11374002	4

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Supplier	Substance	Batch	Spectra
Caelo	Agrimony, cut	10325503	5
Caelo	Agrimony, cut	9300110	1
Caelo	Agrimony, cut	9300107	1
Caelo	Agrimony, cut	1137407	1
Caelo	Alchemilla alpina her…	11063608	1
Caelo	Alchemilla alpina her…	12147203-3470312131	1
Caelo	Alchemilla alpina her…	12147206	3
Caelo	Alchemilla alpina her…	1214204	1
Caelo	Alchemilla alpina her…	12147202	3
Caelo	Alchemilla alpina her…	12147205	2
Caelo	Alchemilla alpina her…	12147203	1
Caelo	Alchemilla, cut	13091304	1
Caelo	Alchemilla, cut	131411002	1
Caelo	Alchemilla, cut	13141101	8
Caelo	Alchemilla, cut	13141102	7
Caelo	Alchemilla, cut	13141103	41
Caelo	Alchemilla, cut	13141105	3
Caelo	Alchemilla, cut	125306	1
Caelo	Alchemilla, cut	12342901	1
Caelo	Alchemilla, cut	12153307	3
Caelo	Alchemilla, cut	12153306	10
Caelo	Alchemilla, cut	12153305	30
Caelo	Alchemilla, cut	12153303	8
Caelo	Alchemilla, cut	13141106	11
Caelo	Alchemilla, cut	1182806	1
Caelo	Alchemilla, cut	1406211616	1
Caelo	Alchemilla, cut	14066002	2
Caelo	Alchemilla, cut	1215309	1
Caelo	Alchemilla, cut	14066003	2
Caelo	Alchemilla, cut	14066008	1
Caelo	Alchemilla, cut	15147002	2
Caelo	Alchemilla, cut	21081203	1
Caelo	Alchemilla, cut	27011401	1
Caelo	Alchemilla, cut	2913l-01616	1
Caelo	Alchemilla, cut	3613M01616	1
Caelo	Alchemilla, cut	5013I1616	1
Caelo	Alchemilla, cut	H-040513-2	1
Caelo	Alchemilla, cut	intch:318080	1
Caelo	Alchemilla, cut	13141110	1
Caelo	Alchemilla, cut	1215305	2
Caelo	Alchemilla, cut	8121201	1
Caelo	Alchemilla, cut	1182808	1
Caelo	Alchemilla, cut	11002906	7
Caelo	Alchemilla, cut	12153301	5
Caelo	Alchemilla, cut	12153302	19
Caelo	Alchemilla, cut	13141106-3545412081	1
Caelo	Alchemilla, cut	13141103-3456311103	1
Caelo	Alchemilla, cut	13141103-3400310161	1
Caelo	Alchemilla, cut	13141103-3382319003	1
Caelo	Alchemilla, cut	1213309	1
Caelo	Alchemilla, cut	11002907	4
Caelo	Alchemilla, cut	1100912	1
Caelo	Alchemilla, cut	11182801	5
Caelo	Alchemilla, cut	11182803	1
Caelo	Alchemilla, cut	9346207	1
Caelo	Alchemilla, cut	2101211616	1
Caelo	Alchemilla, cut	2081304	1
Caelo	Alchemilla, cut	5041301	1
Caelo	Alchemilla, cut	9011405	1
Caelo	Alchemilla, cut	11063605	1

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Supplier	Substance	Batch	Spectra
Caelo	Alchemilla, cut	1118206	1
Caelo	Alchemilla, cut	11182805	4
Caelo	Alchemilla, cut	11182804	5
Caelo	Alchemilla, cut	11182807	4
Caelo	Alchemilla, cut	11182808	1
Caelo	Almonds, bitter, whole	13242001	1
Caelo	Almonds, bitter, whole	12239604	1
Caelo	Almonds, bitter, whole	5121301	1
Caelo	Almonds, bitter, whole	15193103	1
Caelo	Almonds, bitter, whole	16221202	1
Caelo	Aloes, cape, cut	1313M-01089	1
Caelo	Aloes, cape, cut	12232102	3
Caelo	Aloes, cape, cut	16202401	1
Caelo	Aloes, cape, cut	12232105	1
Caelo	Aloes, cape, cut	12338209	2
Caelo	Aloes, cape, cut	25111303	1
Caelo	Aloes, cape, cut	12338206	4
Caelo	Aloes, cape, cut	25071402	1
Caelo	Aloes, cape, cut	11048808	1
Caelo	Aloes, cape, cut	12338203	5
Caelo	Aloes, cape, cut	11061406	1
Caelo	Aloes, cape, cut	11041402	1
Caelo	Aloes, cape, cut	505125	1
Caelo	Aloes, cape, cut	15283001	1
Caelo	Aloes, cape, cut	12338201	4
Caelo	Aloes, cape, powdered	15125403	1
Caelo	Aloes, cape, powdered	15206501	1
Caelo	Aloes, cape, powdered	15206507	1
Caelo	Aloes, cape, powdered	12183009	3
Caelo	Aloes, cape, powdered	11132115	1
Caelo	Aloes, cape, powdered	11132116	2
Caelo	Aloes, cape, powdered	12183013	3
Caelo	Aloes, cape, powdered	12183001	2
Caelo	Aloes, cape, powdered	12183005	2
Caelo	Aloes, cape, powdered	14065906	1
Caelo	Aloes, cape, powdered	12183008	1
Caelo	Aloes, cape, powdered	12183007	1
Caelo	Aloes, cape, powdered	14065905	1
Caelo	Aloes, cape, powdered	11132116	1
Caelo	Aluminium chloride he…	13/13-B03-287298	1
Caelo	Aluminium chloride he…	12323710	8
Caelo	Aluminium chloride he…	1406021-01	3
Caelo	Aluminium chloride he…	12114912	7
Caelo	Aluminium chloride he…	12323703	1
Caelo	Aluminium chloride he…	12114908	13
Caelo	Aluminium chloride he…	12114906	7
Caelo	Aluminium chloride he…	12114904	2
Caelo	Aluminium chloride he…	121149006	1
Caelo	Aluminium chloride he…	27081301	1
Caelo	Aluminium chloride he…	121001402	2
Caelo	Aluminium chloride he…	10251307	1
Caelo	Aluminium chloride he…	10251309	1
Caelo	Aluminium chloride he…	12047514	5
Caelo	Aluminium chloride he…	10251314	1
Caelo	Aluminium chloride he…	12127-N01	1
Caelo	Aluminium chloride he…	12114918	18
Caelo	Aluminium chloride he…	15051302	1
Caelo	Aluminium chloride he…	9071303	1
Caelo	Aluminium chloride he…	11229917	4
Caelo	Aluminium chloride he…	23051205	1

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Supplier	Substance	Batch	Spectra
Caelo	Aluminium chloride he…	8031301	1
Caelo	Aluminium chloride he…	12323711	22
Caelo	Aluminium chloride he…	15080701	1
Caelo	Aluminium chloride he…	1210014-01	26
Caelo	Aluminium chloride he…	23071204	1
Caelo	Aluminium chloride he…	2313A-01095	1
Caelo	Aluminium chloride he…	12114920	14
Caelo	Aluminium chloride he…	12323717	5
Caelo	Aluminium chloride he…	12047505	4
Caelo	Aluminium chloride he…	12047503	3
Caelo	Aluminium chloride he…	12114919	1
Caelo	Aluminium chloride he…	12114922	19
Caelo	Aluminium chloride he…	23111203	1
Caelo	Aluminium chloride he…	12114910	9
Caelo	Aluminium chloride he…	28121301	1
Caelo	Aluminium chloride he…	15080715	1
Caelo	Aluminium chloride he…	13G03-N02	25
Caelo	Aluminium chloride he…	5081301	1
Caelo	Aluminium chloride he…	13L13-B03-287298	1
Caelo	Aluminium chloride he…	11229905	1
Caelo	Aluminium chloride he…	11229906	1
Caelo	Aluminium chloride he…	12114907	1
Caelo	Aluminium chloride he…	51/AD1	1
Caelo	Aluminium chloride he…	1233702	1
Caelo	Aluminium chloride he…	11229907	1
Caelo	Aluminium chloride he…	19041302	1
Caelo	Aluminium chloride he…	11229914	2
Caelo	Aluminium chloride he…	18061308	1
Caelo	Aluminium chloride he…	130701101	1
Caelo	Aluminium chloride he…	3091205	1
Caelo	Aluminium chloride he…	12021303	1
Caelo	Aluminium chloride he…	3113E-01095	1
Caelo	Aluminium chloride he…	11229913	2
Caelo	Aluminium potassium s…	13098702	1
Caelo	Aluminium potassium s…	12022404	3
Caelo	Aluminium potassium s…	12022406	3
Caelo	Aluminium potassium s…	12022406	2
Caelo	Aluminium potassium s…	11218611	3
Caelo	Aluminium potassium s…	12144602	1
Caelo	Aluminium potassium s…	12184407	3
Caelo	Aluminium potassium s…	12184408	3
Caelo	Aluminium potassium s…	12184411	5
Caelo	Aluminium potassium s…	12144607	2
Caelo	Aluminium potassium s…	12022444	1
Caelo	Aluminium potassium s…	14263804	1
Caelo	Aluminium potassium s…	15172501	1
Caelo	Aluminium potassium s…	11254805	1
Caelo	Aluminium potassium s…	12184407	6
Caelo	Aluminium potassium s…	12022409	1
Caelo	Aluminium potassium s…	510211092	1
Caelo	Aluminium potassium s…	12239102	2
Caelo	Aluminium potassium s…	1218411	1
Caelo	Aluminium potassium s…	13025414	1
Caelo	Aluminium potassium s…	90033229	1
Caelo	Aluminium potassium s…	2713Q1092	1
Caelo	Aluminium potassium s…	12|24-M03	1
Caelo	Aluminium potassium s…	13025401	4
Caelo	Aluminium potassium s…	12144603	1
Caelo	Aluminium potassium s…	12022404	1
Caelo	Aluminium potassium s…	12184401	3

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Supplier	Substance	Batch	Spectra
Caelo	Aluminium potassium s…	13025404	3
Caelo	Aluminium potassium s…	11G01-N04	1
Caelo	Aluminium potassium s…	504311092	1
Caelo	Aluminium potassium s…	12184401	1
Caelo	Aluminium potassium s…	12144605	4
Caelo	Aluminium potassium s…	11017211	1
Caelo	Aluminium potassium s…	13356103	2
Caelo	Ammonium chloride	12356101	3
Caelo	Ammonium chloride	10176309	1
Caelo	Ammonium chloride	12240302	4
Caelo	Ammonium chloride	10176319	3
Caelo	Ammonium hydrogen car…	4112M-01103	1
Caelo	Ammonium hydrogen car…	11145612	3
Caelo	Ammonium hydrogen car…	9139402	1
Caelo	Ammonium hydrogen car…	72715338	2
Caelo	Ammonium hydrogen car…	3091204	1
Caelo	Ammonium hydrogen car…	3712Q-01103	1
Caelo	Ammonium hydrogen car…	25111308	1
Caelo	Ammonium hydrogen car…	24101202	1
Caelo	Ammonium hydrogen car…	23101204	1
Caelo	Ammonium hydrogen car…	13104611	1
Caelo	Ammonium hydrogen car…	13104601	1
Caelo	Ammonium hydrogen car…	12322204	1
Caelo	Ammonium hydrogen car…	23011404	1
Caelo	Ammonium hydrogen car…	12322201	1
Caelo	Amphetamine sulfate	15193204	1
Caelo	Amphetamine sulfate	15L01-B05	3
Caelo	Amphetamine sulfate	16153909	1
Caelo	Amphetamine sulfate	lot067002	1
Caelo	Amphetamine sulfate	13344605	1
Caelo	Amphetamine sulfate	12I24-N03	1
Caelo	Amphetamine sulfate	12B06-N013	1
Caelo	Amphetamine sulfate	12095607	1
Caelo	Amphetamine sulfate	13344609	1
Caelo	Amphetamine sulfate	13344602	1
Caelo	Angelica root	269775	3
Caelo	Angelica root	11093310	1
Caelo	Angelica root	Int.Ch:318090	1
Caelo	Angelica root	11093304	1
Caelo	Angelica root	5162606	1
Caelo	Angelica root	3412Q-02127	1
Caelo	Angelica root	28101402	1
Caelo	Angelica root	16128002	1
Caelo	Angelica root	15162604	2
Caelo	Angelica root	274128	4
Caelo	Angelica root	21011402	1
Caelo	Angelica root	15101304	1
Caelo	Angelica root	5091303	1
Caelo	Angelica root	12168701	5
Caelo	Angelica root	9030301	1
Caelo	Angelica root	12080403	1
Caelo	Angelica root	12080412	1
Caelo	Angelica root	12350705	1
Caelo	Angelica root	12350704	2
Caelo	Angelica root	12350703	9
Caelo	Angelica root	12350701	1
Caelo	Angelica root	12345	1
Caelo	Angelica root	10071306	1
Caelo	Angelica root	12168702	2
Caelo	Angelica root	11259803	1

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Supplier	Substance	Batch	Spectra
Caelo	Angelica root	12070806	1
Caelo	Angelica root	303299	1
Caelo	Angelica root	30011302	1
Caelo	Angelica root	12168705	2
Caelo	Angelica root	14178506	1
Caelo	Angelica root	14179506	2
Caelo	Aniseed	10247203	3
Caelo	Aniseed	11101213	7
Caelo	Aniseed	13037804	8
Caelo	Aniseed	13037808-3560412014	1
Caelo	Aniseed	140913a	1
Caelo	Aniseed	15046101	8
Caelo	Aniseed	11101204	1
Caelo	Aniseed	11101214	7
Caelo	Aniseed	15046103	1
Caelo	Aniseed	15046107	1
Caelo	Aniseed	3314E-01530	1
Caelo	Aniseed	15046109	4
Caelo	Aniseed	15046102	6
Caelo	Aniseed	13037805	13
Caelo	Aniseed	11101215	3
Caelo	Aniseed	11370301	11
Caelo	Aniseed	1137033	1
Caelo	Aniseed	12360801	1
Caelo	Aniseed	13037802	11
Caelo	Aniseed	13333910	4
Caelo	Aniseed	13333914	1
Caelo	Aniseed	13037803	2
Caelo	Aniseed	111101213	1
Caelo	Aniseed	411081/1	1
Caelo	Aniseed	11370304	10
Caelo	Aniseed	2700A140129	7
Caelo	Aniseed	2700A130527	15
Caelo	Aniseed	11370303	15
Caelo	Aniseed	11370302	7
Caelo	Aniseed	13333909	2
Caelo	Aniseed	2916E-01530	1
Caelo	Aniseed	11101202	3
Caelo	Aniseed	11370308	6
Caelo	Aniseed	15283201	3
Caelo	Aniseed	13333903	6
Caelo	Aniseed	17045603	1
Caelo	Aniseed	13333906	3
Caelo	Aniseed	13333901	6
Caelo	Aniseed	133333902	1
Caelo	Aniseed	1307809	1
Caelo	Aniseed	13037901	1
Caelo	Aniseed	16165306	1
Caelo	Aniseed	16165305	2
Caelo	Aniseed	16165304	1
Caelo	Aniseed	13037809	14
Caelo	Aniseed	4061301	1
Caelo	Aniseed	16165303	1
Caelo	Aniseed	15398605	3
Caelo	Aniseed	15398607	1
Caelo	Aniseed	5061301	1
Caelo	Aniseed	13037807	1
Caelo	Aniseed	5091304	1
Caelo	Aniseed	5121401	1
Caelo	Aniseed	13333908	12

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Supplier	Substance	Batch	Spectra
Caelo	Aniseed	21021312	1
Caelo	Aniseed	13037806	2
Caelo	Aniseed	13037808	12
Caelo	Aniseed		1
Caelo	Aniseed	2213M-01530	1
Caelo	Aniseed	15398603	2
Caelo	Aniseed	10081207	1
Caelo	Aniseed	10247202	1
Caelo	Aniseed	2215M-01530	1
Caelo	Aniseed, pounded	15149702	1
Caelo	Aniseed, pounded	23041303	1
Caelo	Aniseed, pounded	4041302	1
Caelo	Aniseed, pounded	12111304	1
Caelo	Aniseed, pounded	13149902	1
Caelo	Aniseed, pounded	12360803	2
Caelo	Aniseed, pounded	1314990	1
Caelo	Aniseed, pounded	12111303	3
Caelo	Aniseed, pounded	12111301	1
Caelo	Aniseed, pounded	11242003	1
Caelo	Apple, cut	12227301	1
Caelo	Arnica flower	122227202	1
Caelo	Arnica flower	11374105	1
Caelo	Arnica flower	11374103	1
Caelo	Arnica flower	11374102	3
Caelo	Arnica flower	6112013A	1
Caelo	Arnica flower	12227202	1
Caelo	Arnica flower	10081204	1
Caelo	Arnica flower	11259803	2
Caelo	Arnica flower	11259804	1
Caelo	Arnica flower	11374101	2
Caelo	Arnica flower	10207405	2
Caelo	Arnica flower	1222702	1
Caelo	Arnica flower	11285705	1
Caelo	Arnica flower	IntCh:212032	1
Caelo	Arnica flower	11285703	1
Caelo	Arnica flower	12227203	1
Caelo	Arnica flower	28071201	1
Caelo	Artichoke leaf, cut	13037608	1
Caelo	Artichoke leaf, cut	13037603	3
Caelo	Artichoke leaf, cut	12173307	6
Caelo	Artichoke leaf, cut	12173306	2
Caelo	Artichoke leaf, cut	12173304	2
Caelo	Artichoke leaf, cut	81232298	1
Caelo	Artichoke leaf, cut	3110Q-03593	1
Caelo	Artichoke leaf, cut	13037605	1
Caelo	Artichoke leaf, cut	nachprüfung	2
Caelo	Artichoke leaf, cut	2312I-03593	1
Caelo	Artichoke leaf, cut	12173302	3
Caelo	Artichoke leaf, cut	11151908	2
Caelo	Artichoke leaf, cut	13310706	1
Caelo	Artichoke leaf, cut	12173307-3260315072	1
Caelo	Artichoke leaf, cut	13037607	4
Caelo	Ash leaf, cut	9344908	1
Caelo	Ash leaf, cut	12225504	1
Caelo	Ash leaf, cut	12225502	1
Caelo	Ash leaf, cut	12225505	2
Caelo	Asparagus root, cut	13193302	1
Caelo	Asparagus root, cut	13071002	2
Caelo	Barberries	12217106	1
Caelo	Barberries	12217103	3

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Supplier	Substance	Batch	Spectra
Caelo	Barberries	11058320	1
Caelo	Barberries	1221707	1
Caelo	Barberries	16224202	1
Caelo	Barberries	12217113	2
Caelo	Barberries	12217107	1
Caelo	Barberries	12217111	1
Caelo	Barberries	12217116	1
Caelo	Barberry root bark, cut	12112608	1
Caelo	Barberry root bark, cut	55B110128	1
Caelo	Barberry root bark, cut	12112605	1
Caelo	Barberry root bark, cut	12112603	2
Caelo	Barberry root bark, cut	12112601	1
Caelo	Barberry root bark, cut	12112602	2
Caelo	Barberry root bark, cut	12112606	4
Caelo	Barberry root bark, cut	nachprüfung	1
Caelo	Barberry root bark, cut	11083509	1
Caelo	Barberry root bark, cut	11083507	1
Caelo	Basil, rubbed	13048605-3519411022	1
Caelo	Basil, rubbed	13048601	2
Caelo	Basil, rubbed	12007010	4
Caelo	Basil, rubbed	13048605	2
Caelo	Basil, rubbed	3632A110201	4
Caelo	Basil, rubbed	nachprüfung	1
Caelo	Basil, rubbed	12007008	2
Caelo	Basil, rubbed	12066404	3
Caelo	Bean shells, cut	11030605	1
Caelo	Bean shells, cut	12358703	5
Caelo	Bean shells, cut	11030601	1
Caelo	Bean shells, cut	10006507	1
Caelo	Bean shells, cut	10006504	1
Caelo	Bean shells, cut	8301004	1
Caelo	Bean shells, cut	1103061	1
Caelo	Bean shells, cut	11030604	6
Caelo	Bean shells, cut	6031301	1
Caelo	Bean shells, cut	13333801	1
Caelo	Bean shells, cut	13333803	1
Caelo	Bean shells, cut	11233603	2
Caelo	Bean shells, cut	29091201	1
Caelo	Bean shells, cut	15060905	1
Caelo	Bean shells, cut	1333802	1
Caelo	Bean shells, cut	14080002	1
Caelo	Bearberry leaf, cut	12186503	2
Caelo	Bearberry leaf, cut	15051303	1
Caelo	Bearberry leaf, cut	2811Q-01518	1
Caelo	Bearberry leaf, cut	11213005	5
Caelo	Bearberry leaf, cut	12186506	7
Caelo	Bearberry leaf, cut	280889	3
Caelo	Bearberry leaf, cut	4091301	1
Caelo	Bearberry leaf, cut	11213003	1
Caelo	Bearberry leaf, cut	13067802	2
Caelo	Bearberry leaf, cut	20111210	1
Caelo	Bearberry leaf, cut	17121306	1
Caelo	Bearberry leaf, cut	15116201	1
Caelo	Bearberry leaf, cut	11213010	1
Caelo	Bearberry leaf, cut	92795616	1
Caelo	Bearberry leaf, cut	3108201204	1
Caelo	Bearberry leaf, cut	12186504	1
Caelo	Bearberry leaf, cut	1218602	1
Caelo	Bearberry leaf, cut	12186502	2
Caelo	Bearberry leaf, cut	4021407	1

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Supplier	Substance	Batch	Spectra
Caelo	Bearberry leaf, cut	9279516	1
Caelo	Bearberry leaf, cut	412A-01518	1
Caelo	Bearberry leaf, cut	13067805	7
Caelo	Bearberry leaf, cut	4689145	1
Caelo	Bearberry leaf, cut	9279515	1
Caelo	Bearberry leaf, cut	5111301	1
Caelo	Bearberry leaf, cut	8120	1
Caelo	Bearberry leaf, cut	13067805-3390311080	1
Caelo	Bentonite	fürHerrSalloch	1
Caelo	Bentonite	1307016-01	1
Caelo	Bentonite	1311014-01	1
Caelo	Betamethasone-17-vale…	12a05-no8	1
Caelo	Betamethasone-17-vale…	12A05-N08	3
Caelo	Betony herb, cut	13048906	1
Caelo	Betony herb, cut	12007205	3
Caelo	Betony herb, cut	11247205	1
Caelo	Betony herb, cut	12007208	2
Caelo	Betony herb, cut	134048903	1
Caelo	Betony herb, cut	13367802	1
Caelo	Bilberry fruit, dried	10265603	1
Caelo	Bilberry fruit, dried	26061301	1
Caelo	Bilberry fruit, dried	10273711	2
Caelo	Bilberry fruit, dried	18101307	1
Caelo	Bilberry fruit, dried	13130504	1
Caelo	Bilberry fruit, dried	13130501	3
Caelo	Bilberry fruit, dried	12183704	5
Caelo	Bilberry fruit, dried	10273709	1
Caelo	Bilberry fruit, dried	10273708	1
Caelo	Bilberry fruit, dried	10273707	1
Caelo	Bilberry fruit, dried	10265601	1
Caelo	Bilberry fruit, dried	12183701	2
Caelo	Bilberry leaf, cut	10222601	1
Caelo	Bilberry leaf, cut	nachprüfung	1
Caelo	Bilberry leaf, cut	511OJ-01506	1
Caelo	Bilberry leaf, cut	23111201	1
Caelo	Bilberry leaf, cut	13009901	3
Caelo	Bilberry leaf, cut	13009903	4
Caelo	Bilberry leaf, cut	13009907	2
Caelo	Bilberry leaf, cut	1300907	1
Caelo	Bilberry leaf, cut	12140206	2
Caelo	Bilberry leaf, cut	12140205	1
Caelo	Bilberry leaf, cut	12140204	5
Caelo	Bilberry leaf, cut	12140201	2
Caelo	Bilberry leaf, cut	9367603	2
Caelo	Bilberry leaf, cut	3091302	1
Caelo	Bilberry leaf, cut	13009905	1
Caelo	Bilberry leaf, cut	13009904	3
Caelo	Birch leaf, cut	12193002	1
Caelo	Birch leaf, cut	14360703	1
Caelo	Birch leaf, cut	13108906	1
Caelo	Birch leaf, cut	13108905	9
Caelo	Birch leaf, cut	3013E-01481	1
Caelo	Birch leaf, cut	107063	1
Caelo	Birch leaf, cut	12193109	15
Caelo	Birch leaf, cut	14360702	1
Caelo	Birch leaf, cut	IntCh:311092	1
Caelo	Birch leaf, cut	12193108	1
Caelo	Birch leaf, cut	nachprüfung	1
Caelo	Birch leaf, cut	11189509	1
Caelo	Birch leaf, cut	13108917	1

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Supplier	Substance	Batch	Spectra
Caelo	Birch leaf, cut	11189507	1
Caelo	Birch leaf, cut	13337303-3561412013	1
Caelo	Birch leaf, cut	261441	1
Caelo	Birch leaf, cut	12193003	1
Caelo	Birch leaf, cut	11189501	2
Caelo	Birch leaf, cut	13337302	1
Caelo	Birch leaf, cut	13337303	1
Caelo	Birch leaf, cut	11050102	4
Caelo	Birch leaf, cut	11189502	2
Caelo	Birch leaf, cut	11189510	3
Caelo	Birch leaf, cut	13108916	1
Caelo	Bitter fennel	13020801	4
Caelo	Bitter fennel	15006501	2
Caelo	Bitter fennel	15006506	1
Caelo	Bitter fennel	9121305	1
Caelo	Bitter fennel	15006507	2
Caelo	Bitter fennel	13020802	7
Caelo	Bitter fennel	13200401	4
Caelo	Bitter fennel	1320041	1
Caelo	Bitter fennel	12167101	1
Caelo	Bitter fennel	4911E-1545	1
Caelo	Bitter fennel	13148304-3500411070	1
Caelo	Bitter fennel	12094716-3408310191	1
Caelo	Bitter fennel	402311545	1
Caelo	Bitter fennel	4061302	1
Caelo	Bitter fennel	5061302	1
Caelo	Bitter fennel	6091201	1
Caelo	Bitter fennel	1302081	1
Caelo	Bitter fennel	12345678	1
Caelo	Bitter fennel	12094710	1
Caelo	Bitter fennel	nachprüfung	1
Caelo	Bitter fennel	15443202	2
Caelo	Bitter fennel	15443203	2
Caelo	Bitter fennel	15443204	4
Caelo	Bitter fennel	15443205	2
Caelo	Bitter fennel	15443208	1
Caelo	Bitter fennel	15443209	2
Caelo	Bitter fennel	15443212	1
Caelo	Bitter fennel	15443215	1
Caelo	Bitter fennel	154443204	1
Caelo	Bitter fennel	16005902	1
Caelo	Bitter fennel	16298102	1
Caelo	Bitter fennel	1S443206	1
Caelo	Bitter fennel	7031306	1
Caelo	Bitter fennel	10109010	1
Caelo	Bitter fennel	11016331	5
Caelo	Bitter fennel	11016332	1
Caelo	Bitter fennel	1106330	1
Caelo	Bitter fennel	11185501	1
Caelo	Bitter fennel	16061202	1
Caelo	Bitter fennel	2860A110704	6
Caelo	Bitter fennel	12035102	2
Caelo	Bitter fennel	11016330	1
Caelo	Bitter fennel	27121201	1
Caelo	Bitter fennel	12094711	1
Caelo	Bitter fennel	1209474	1
Caelo	Bitter fennel	12167102	4
Caelo	Bitter fennel	11016309	1
Caelo	Bitter fennel	12094703	2
Caelo	Bitter fennel	15141004	1

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Supplier	Substance	Batch	Spectra
Caelo	Bitter fennel	12094704	8
Caelo	Bitter fennel	13148305	4
Caelo	Bitter fennel	13148306	1
Caelo	Bitter fennel	12094715	6
Caelo	Bitter fennel	14376408	6
Caelo	Bitter fennel	14376406	2
Caelo	Bitter fennel	12094716	10
Caelo	Bitter fennel	13148307	3
Caelo	Bitter fennel	14376405	1
Caelo	Bitter fennel	12094717	1
Caelo	Bitter fennel	13148304	23
Caelo	Bitter fennel	14376402	1
Caelo	Bitter fennel	12094721	4
Caelo	Bitter fennel	13200402	2
Caelo	Bitter fennel	13371604	1
Caelo	Bitter fennel	13371610	2
Caelo	Bitter fennel	13398502	1
Caelo	Bitter fennel	14255802	3
Caelo	Bitter fennel	14376401	1
Caelo	Bitter fennel	12094720	7
Caelo	Bitter fennel	15007601	1
Caelo	Bitter fennel	12094719	5
Caelo	Bitter fennel	13148303	2
Caelo	Bitter fennel	12094712	6
Caelo	Bitter fennel	12094726	1
Caelo	Bitter fennel	15443203	2
Caelo	Bitter fennel	15046107	1
Caelo	Bitter fennel	14376408;21S08	1
Caelo	Bitter fennel	11016318	1
Caelo	Bitter fennel	12362710	1
Caelo	Bitter fennel	15006501	3
Caelo	Bitter fennel	14376408	1
Caelo	Bitter fennel	12094710	6
Caelo	Bitter fennel	14111301	1
Caelo	Bitter fennel	13398505	1
Caelo	Bitter fennel	13398502	3
Caelo	Bitter fennel	15006508	2
Caelo	Bitter fennel	12094724	4
Caelo	Bitter fennel	13371610	1
Caelo	Bitter fennel	5121401	1
Caelo	Bitter fennel	13371605	1
Caelo	Bitter fennel	12094725	9
Caelo	Bitter fennel	12094720	1
Caelo	Bitter orange flower …	13352701-3518411022	1
Caelo	Bitter orange flower …	2712E-01445	1
Caelo	Bitter orange flower …	12266605	1
Caelo	Bitter orange flower …	13067903	3
Caelo	Bitter orange flower …	11049212	1
Caelo	Bitter orange flower …	13352701	1
Caelo	Bitter orange flower …	12266605	1
Caelo	Bitter orange flower …	12266705	2
Caelo	Bitter orange flower …	12266608	2
Caelo	Bitter orange flower …	12266708	1
Caelo	Bitter orange flower …	12266707	1
Caelo	Bitter orange flower …	12266608	7
Caelo	Bitter orange flower …	12266611	2
Caelo	Bitter orange flower …	12266609	1
Caelo	Bitter orange flower …	6051301	1
Caelo	Bitter orange flower …	11049202	1
Caelo	Bitter orange flower …	12266703	3

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Supplier	Substance	Batch	Spectra
Caelo	Bitter orange flower …	12266614	1
Caelo	Bitter orange flower …	12266601	1
Caelo	Bitter orange flower …	12266611	2
Caelo	Bitter orange peel, cut	21101302	1
Caelo	Bitter orange peel, cut	17111201	1
Caelo	Bitter orange peel, cut	12239203	4
Caelo	Bitter orange peel, cut	27011403	1
Caelo	Bitter orange peel, cut	4312M-01531	1
Caelo	Bitter orange peel, cut	12067405	1
Caelo	Bitter orange peel, cut	13049001	1
Caelo	Bitter orange peel, cut	12067402	1
Caelo	Bitter orange peel, cut	13049002	1
Caelo	Black cohosh, cut	10281118	4
Caelo	Black cohosh, cut	10281104	1
Caelo	Black cohosh, cut	13142101	1
Caelo	Black cohosh, cut	13237907	1
Caelo	Black cohosh, cut	13237901	2
Caelo	Black cohosh, cut	10281112	1
Caelo	Black cohosh, cut	13237903	1
Caelo	Black cumin seed	11233507	1
Caelo	Black cumin seed	10121915	1
Caelo	Black cumin seed	10121916	1
Caelo	Black cumin seed	14359905	1
Caelo	Black cumin seed	13326405	2
Caelo	Black cumin seed	13326406	1
Caelo	Black cumin seed	12358904	1
Caelo	Black cumin seed	12358906	3
Caelo	Black cumin seed	14359903	3
Caelo	Black cumin seed	11233503	2
Caelo	Black cumin seed	13122013b	1
Caelo	Black cumin seed	12358901	4
Caelo	Black cumin seed	12358903	2
Caelo	Black cumin seed	12358902	1
Caelo	Black cumin seed	11233502	2
Caelo	Black mustard seed	13038904	1
Caelo	Black mustard seed	12189307	1
Caelo	Black mustard seed	14057702	1
Caelo	Black mustard seed, p…	1200970601-13	1
Caelo	Black mustard seed, p…	12009702	5
Caelo	Black mustard seed, p…	12350202-3369319012	1
Caelo	Black mustard seed, p…	15214713	2
Caelo	Black mustard seed, p…	12208601	3
Caelo	Black mustard seed, p…	14162810	2
Caelo	Black mustard seed, p…	12208602	7
Caelo	Black mustard seed, p…	25011401	2
Caelo	Black mustard seed, p…	12009706	2
Caelo	Black mustard seed, p…	15214714	1
Caelo	Black mustard seed, p…	12009703	1
Caelo	Black mustard seed, p…	12350202	17
Caelo	Black mustard seed, p…	14293710	2
Caelo	Black mustard seed, p…	12350205	3
Caelo	Black mustard seed, p…	13097705	7
Caelo	Black mustard seed, p…	12350207	5
Caelo	Black mustard seed, p…	12350208	9
Caelo	Black mustard seed, p…	15214707	1
Caelo	Black mustard seed, p…	14293702	6
Caelo	Black mustard seed, p…	12350209	1
Caelo	Black mustard seed, p…	12350210	1
Caelo	Black mustard seed, p…	12350211	3
Caelo	Black mustard seed, p…	13097701	14

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Supplier	Substance	Batch	Spectra
Caelo	Black mustard seed, p…	12208604	4
Caelo	Black mustard seed, p…	23061401	1
Caelo	Black mustard seed, p…	13097706	3
Caelo	Black mustard seed, p…	15214708	3
Caelo	Black mustard seed, p…	15214706	3
Caelo	Black mustard seed, p…	15214703	2
Caelo	Black mustard seed, p…	14293701	2
Caelo	Black mustard seed, p…	16051802	1
Caelo	Black mustard seed, p…	13097702	5
Caelo	Black mustard seed, p…	14245601	1
Caelo	Black mustard seed, p…	14162810	3
Caelo	Black mustard seed, p…	14162808	1
Caelo	Black mustard seed, p…	16051807	1
Caelo	Black mustard seed, p…	16051807	1
Caelo	Black mustard seed, p…	16051810	3
Caelo	Black mustard seed, p…	15214703	1
Caelo	Black mustard seed, p…	2015Q-02244	1
Caelo	Black mustard seed, p…	15131105	1
Caelo	Black mustard seed, p…	15131104	1
Caelo	Black mustard seed, p…	14162807	2
Caelo	Black mustard seed, p…	15131102	2
Caelo	Black mustard seed, p…	16272703	6
Caelo	Black mustard seed, p…	14162802	1
Caelo	Black mustard seed, p…	13358304	7
Caelo	Black mustard seed, p…	13358302	13
Caelo	Black mustard seed, p…	16272704	1
Caelo	Black mustard seed, p…	13097704	4
Caelo	Black mustard seed, p…	15131101	1
Caelo	Black mustard seed, p…	16272707	3
Caelo	Black mustard seed, p…	16333501	1
Caelo	Black mustard seed, p…	14293713	1
Caelo	Black mustard seed, p…	14293706	1
Caelo	Black pepper	12192309	1
Caelo	Black pepper	12192305	1
Caelo	Black pepper	12192304	1
Caelo	Black pepper	12192306	1
Caelo	Black pepper	12192307	1
Caelo	Black pepper	11193911	1
Caelo	Black pepper	13221110	1
Caelo	Blackberry leaf, cut	11030707	6
Caelo	Blackberry leaf, cut	13091206	1
Caelo	Blackberry leaf, cut	13101610	1
Caelo	Blackberry leaf, cut	13127901	1
Caelo	Blackberry leaf, cut	14019010	1
Caelo	Blackberry leaf, cut	3011E-01512	1
Caelo	Blackberry leaf, cut	15039301	1
Caelo	Blackberry leaf, cut	11030701	2
Caelo	Blackberry leaf, cut	2110E-01512	1
Caelo	Blackberry leaf, cut	2271c120508	1
Caelo	Blackberry leaf, cut	10136412	2
Caelo	Blackberry leaf, cut	28061202	1
Caelo	Blackberry leaf, cut	14111318	1
Caelo	Blackberry leaf, cut	3091303	1
Caelo	Blackberry leaf, cut	10136408	7
Caelo	Blackberry leaf, cut	10136403	1
Caelo	Blackberry leaf, cut	11030706	1
Caelo	Blackberry leaf, cut	nachprüfung	1
Caelo	Blackberry leaf, cut	11030704	4
Caelo	Blackcurrant leaf, cut	9373913	1
Caelo	Blackcurrant leaf, cut	12115902	2

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Supplier	Substance	Batch	Spectra
Caelo	Blackcurrant leaf, cut	12168801	1
Caelo	Blackcurrant leaf, cut	80558228	1
Caelo	Blackcurrant leaf, cut	12168804	1
Caelo	Blackcurrant leaf, cut	12168810	4
Caelo	Blackcurrants	12272804	3
Caelo	Blackcurrants	14212501	1
Caelo	Blackthorn flower	11206906	1
Caelo	Blackthorn flower	12178104	4
Caelo	Blackthorn flower	12178105	1
Caelo	Blackthorn flower	12178101	2
Caelo	Blackthorn flower	12178103	3
Caelo	Blackthorn flower	12178102	9
Caelo	Blessed thistle, cut	13389701	1
Caelo	Blessed thistle, cut	9355208	1
Caelo	Blessed thistle, cut	13025902	1
Caelo	Blessed thistle, cut	103225403	1
Caelo	Blessed thistle, cut	3091301	1
Caelo	Blessed thistle, cut	4743554	1
Caelo	Blessed thistle, cut	13025903	3
Caelo	Blessed thistle, cut	13025901	6
Caelo	Blessed thistle, cut	12038203	3
Caelo	Blessed thistle, cut	12038202	1
Caelo	Blessed thistle, cut	10325404	2
Caelo	Blessed thistle, cut	10325402	6
Caelo	Blessed thistle, cut	2513A-01628	1
Caelo	Blessed thistle, cut	27111205	1
Caelo	Blue bottle flower wi…	613Q-01456	1
Caelo	Blue bottle flower wi…	510e-01456	1
Caelo	Blue bottle flower wi…	12060202	2
Caelo	Blue bottle flower wi…	15206601	1
Caelo	Blue bottle flower wi…	12060203	4
Caelo	Blue bottle flower wi…	12232501	3
Caelo	Blue bottle flower wi…	14323302	1
Caelo	Blue bottle flower wi…	12060205	4
Caelo	Blue bottle flower wi…	11059211	2
Caelo	Blue bottle flower wi…	10291105	1
Caelo	Blue bottle flower wi…	11059206	3
Caelo	Blue bottle flower wi…	11059209	2
Caelo	Bogbean leaf, cut	12226101	1
Caelo	Bogbean leaf, cut	12226104	1
Caelo	Bogbean leaf, cut	13123902	2
Caelo	Bogbean leaf, cut	13149001	1
Caelo	Bogbean leaf, cut	1712E-01517	1
Caelo	Bogbean leaf, cut	13123901	2
Caelo	Bogbean leaf, cut	1226101	1
Caelo	Boldo leaf, cut	11016506	2
Caelo	Boldo leaf, cut	12227004	1
Caelo	Boldo leaf, cut	11016508	1
Caelo	Boldo leaf, cut	11016511	1
Caelo	Boldo leaf, cut	12064303	1
Caelo	Boldo leaf, cut	12227005	2
Caelo	Boldo leaf, cut	12064305	1
Caelo	Boldo leaf, cut	655456	1
Caelo	Boldo leaf, cut	12064306	1
Caelo	Boldo leaf, cut	11016509	1
Caelo	Boldo leaf, cut	11016502	1
Caelo	Bucho leaf	13056601	3
Caelo	Bucho leaf	13056602	2
Caelo	Bucho leaf	13056605	1
Caelo	Buckwheat herb, cut	5111302	1

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Supplier	Substance	Batch	Spectra
Caelo	Buckwheat herb, cut	11212809	1
Caelo	Buckwheat herb, cut	11212612	1
Caelo	Buckwheat herb, cut	30041301	1
Caelo	Buckwheat herb, cut	13193203	1
Caelo	Buckwheat herb, cut	11212812	1
Caelo	Buckwheat herb, cut	11212807	2
Caelo	Buckwheat herb, cut	11212808	2
Caelo	Buckwheat herb, cut	13051303	1
Caelo	Buckwheat herb, cut	11212817	6
Caelo	Buckwheat herb, cut	2051303	1
Caelo	Buckwheat herb, cut	11212810	1
Caelo	Buckwheat herb, cut	11212815	2
Caelo	Buckwheat herb, cut	11212814	2
Caelo	Burdock root, cut	12295803	3
Caelo	Burdock root, cut	1007306	1
Caelo	Burdock root, cut	10073208	1
Caelo	Burdock root, cut	1100801	1
Caelo	Burdock root, cut	11100801	2
Caelo	Burdock root, cut	11100802	1
Caelo	Burdock root, cut	12295801	2
Caelo	Burdock root, cut	12295802	4
Caelo	Burdock root, cut	13122802	1
Caelo	Burdock root, cut	13122801	2
Caelo	Burdock root, cut	12295808	2
Caelo	Burdock root, cut	12295804	1
Caelo	Burdock root, cut	12295805	2
Caelo	Burdock root, cut	107063	1
Caelo	Burdock root, cut	12295807	1
Caelo	Burnet root	12027410	3
Caelo	Burnet root	8111203	1
Caelo	Burnet root	12027411	4
Caelo	Burnet root	10219402	1
Caelo	Burnet root	nachprüfung	2
Caelo	Burnet root	12027403	1
Caelo	Burnet root	12027405	4
Caelo	Burnet root	12027413	1
Caelo	Burnet root	12027409	1
Caelo	Caffeine citrate	11F21-N05	1
Caelo	Calcium chloride dihy…	12341401	1
Caelo	Calcium chloride dihy…	11230921	2
Caelo	Calcium chloride dihy…	12341404	2
Caelo	Calcium chloride dihy…	12341406	1
Caelo	Calcium chloride dihy…	11230915	1
Caelo	Calcium chloride dihy…	12341409	1
Caelo	Calcium chloride dihy…	12238401	2
Caelo	Calcium chloride dihy…	12B09-N11	1
Caelo	Calcium chloride dihy…	8237314	1
Caelo	Calcium hydrogen phos…	12212812	2
Caelo	Calcium hydrogen phos…	12212809	2
Caelo	Calcium hydrogen phos…	12212807	1
Caelo	Calcium hydrogen phos…	12212806	1
Caelo	Calcium hydrogen phos…	11287510	1
Caelo	Calcium hydrogen phos…	12212813	1
Caelo	Calcium hydrogen phos…	12212816	1
Caelo	Calcium hydrogen phos…	12212822	1
Caelo	Calcium hydrogen phos…	13170704	2
Caelo	Calcium hydrogen phos…	11287503	2
Caelo	Calcium hydrogen phos…	10135223	1
Caelo	Calcium hydrogen phos…	14011401	1
Caelo	Calcium hydrogen phos…	10135222	1

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Supplier	Substance	Batch	Spectra
Caelo	Calcium hydrogen phos…	14085301	1
Caelo	Calcium hydrogen phos…	10135216	1
Caelo	Calcium hydrogen phos…	10135201	1
Caelo	Calcium hydrogen phos…	101352009	1
Caelo	Calcium hydrogen phos…	12212804	8
Caelo	Calcium hydrogen phos…	11287509	2
Caelo	Calcium hydrogen phos…	13170701	6
Caelo	Calcium hydrogen phos…	12212811	5
Caelo	Calcium sulfate dihyd…	12316301	2
Caelo	Calcium sulfate dihyd…	12257703	4
Caelo	Calcium sulfate dihyd…	12257701	1
Caelo	Calcium sulfate dihyd…	10132403	1
Caelo	Calcium sulfate dihyd…	11164005	1
Caelo	Calcium sulfate hemih…	9246320	1
Caelo	Calcium sulfate hemih…	9246322	2
Caelo	Calendula flower	12221511	1
Caelo	Calendula flower	12221508	1
Caelo	Calendula flower	13235503	3
Caelo	Calendula flower	12221510-3356319071	1
Caelo	Calendula flower	12221510-3435311151	1
Caelo	Calendula flower	12221708	3
Caelo	Calendula flower	12221706	2
Caelo	Calendula flower	12221705	1
Caelo	Calendula flower	13235502	3
Caelo	Calendula flower	13235501	1
Caelo	Calendula flower	12221513	1
Caelo	Calendula flower	15291501	1
Caelo	Calendula flower	12221709	1
Caelo	Calendula flower	12221710	1
Caelo	Calendula flower	122221707	1
Caelo	Calendula flower, cut	15040301	1
Caelo	Calendula flower, cut	9121303	1
Caelo	Calendula flower, cut	12221503	1
Caelo	Calendula flower, cut	1325502	1
Caelo	Calendula flower, cut	10117006	1
Caelo	Calendula flower, cut	12221502	2
Caelo	Calendula flower, cut	31121202	1
Caelo	Calendula flower, cut	13235505	1
Caelo	Calendula flower, cut	18121301	1
Caelo	Calendula flower, cut	10117004	3
Caelo	Calendula flower, cut	3061301	1
Caelo	Calendula flower, cut	11187605	1
Caelo	Calendula flower, cut	11187607	4
Caelo	Calendula flower, cut	8041302	1
Caelo	Calendula flower, cut	13235506	2
Caelo	Calendula flower, cut	11187610	5
Caelo	Calendula flower, cut	11187611	5
Caelo	Calendula flower, cut	12221506	1
Caelo	Calendula flower, cut	9112013C	1
Caelo	Calendula flower, cut	13410202	2
Caelo	Calendula flower, cut	12071201	1
Caelo	Calendula flower, cut	11221409	2
Caelo	Calendula flower, cut	11221407	2
Caelo	Calendula flower, cut	5021305	1
Caelo	Calendula flower, cut	3957/V07/14	1
Caelo	Calendula flower, cut	295556	1
Caelo	Calendula flower, cut	12221708	14
Caelo	Calendula flower, cut	AKD1	1
Caelo	Calendula flower, cut	12221701	2
Caelo	Calendula flower, cut	12221710	2

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Supplier	Substance	Batch	Spectra
Caelo	Calendula flower, cut	12221707	3
Caelo	Calendula flower, cut	12221507	1
Caelo	Calendula flower, cut	12221601	6
Caelo	Calendula flower, cut	1187612	3
Caelo	Calendula flower, cut	11187616	1
Caelo	Calendula flower, cut	13235501	4
Caelo	Calendula flower, cut	12221704	15
Caelo	Calendula flower, cut	10291904	4
Caelo	Calendula flower, cut	13235502	11
Caelo	Calendula flower, cut	12221705	5
Caelo	Calendula flower, cut	11187612	16
Caelo	Calendula flower, cut	27101201	1
Caelo	Calendula flower, cut	19111206	1
Caelo	Calendula flower, cut	21091301	1
Caelo	Calendula flower, cut	22061203	1
Caelo	Calendula flower, cut	122221704	1
Caelo	Caraway fruit	413M	1
Caelo	Caraway fruit	13041901	1
Caelo	Caraway fruit	13306002	8
Caelo	Caraway fruit	12226608	4
Caelo	Caraway fruit	12226604	5
Caelo	Caraway fruit	13397102	2
Caelo	Caraway fruit	12226605	4
Caelo	Caraway fruit	15097103	2
Caelo	Caraway fruit	12345	1
Caelo	Caraway fruit	15097111	1
Caelo	Caraway fruit	12343403	1
Caelo	Caraway fruit	15097116	1
Caelo	Caraway fruit	1222608	1
Caelo	Caraway fruit	12228601	1
Caelo	Caraway fruit	12226612	10
Caelo	Caraway fruit	15097107	2
Caelo	Caraway fruit	15097110	1
Caelo	Caraway fruit	1509101	1
Caelo	Caraway fruit	12226606	2
Caelo	Caraway fruit	12226611	3
Caelo	Caraway fruit	13397104	3
Caelo	Caraway fruit	13041903	1
Caelo	Caraway fruit	12226614	5
Caelo	Caraway fruit	1226608	1
Caelo	Caraway fruit	15097115	4
Caelo	Caraway fruit	4061303	1
Caelo	Caraway fruit	150979101	1
Caelo	Caraway fruit	12226501	9
Caelo	Caraway fruit	11003217	7
Caelo	Caraway fruit	11378309	1
Caelo	Caraway fruit	11003211	1
Caelo	Caraway fruit	16308503	1
Caelo	Caraway fruit	11003201	1
Caelo	Caraway fruit	2103311537	1
Caelo	Caraway fruit	11003207	1
Caelo	Caraway fruit	10111213	1
Caelo	Caraway fruit	27121202	1
Caelo	Caraway fruit	15097109	2
Caelo	Caraway fruit	15097101	10
Caelo	Caraway fruit	13397105	9
Caelo	Caraway fruit	16308501	1
Caelo	Caraway fruit	6111206	1
Caelo	Caraway fruit	13367102	1
Caelo	Caraway fruit	13091401	1

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Supplier	Substance	Batch	Spectra
Caelo	Caraway fruit	15097108	5
Caelo	Caraway fruit	12226601	1
Caelo	Caraway fruit	811E-01537	1
Caelo	Caraway fruit	13306003	2
Caelo	Caraway fruit	12226603	9
Caelo	Caraway fruit	13306004	1
Caelo	Caraway fruit	13306008	1
Caelo	Caraway fruit	9267815	1
Caelo	Caraway fruit	610E-01537	1
Caelo	Caraway fruit	15409105	1
Caelo	Caraway fruit	15409104	1
Caelo	Caraway fruit	13306006	5
Caelo	Caraway fruit	12226504	1
Caelo	Caraway fruit	13306005	3
Caelo	Caraway fruit, pounded	14160401	1
Caelo	Caraway fruit, pounded	13367101	1
Caelo	Cardamom fruit	11309110	4
Caelo	Cardamom fruit	13260502-3537411072	1
Caelo	Cardamom fruit	13026003	1
Caelo	Castoreum, powdered	o810I-01236	1
Caelo	Cayenne pepper, powde…	13205106	1
Caelo	Celery root, cut	10270009	1
Caelo	Celery root, cut	12319107	1
Caelo	Celery root, cut	12319105	2
Caelo	Celery root, cut	12319108	1
Caelo	Celery root, cut	10270012	1
Caelo	Centaury, cut	11097609	6
Caelo	Centaury, cut	11097612	17
Caelo	Centaury, cut	3711B120628	1
Caelo	Centaury, cut	1212E-01629	1
Caelo	Centaury, cut	12268601	3
Caelo	Centaury, cut	12268602	18
Caelo	Centaury, cut	12268605	4
Caelo	Centaury, cut	11097611	1
Caelo	Centaury, cut	12268608	13
Caelo	Centaury, cut	12379601	1
Caelo	Centaury, cut	12268606	13
Caelo	Centaury, cut	1523	1
Caelo	Centaury, cut	11097602	2
Caelo	Centaury, cut	11097605	3
Caelo	Centaury, cut	11097608	1
Caelo	Centaury, cut	15224102	1
Caelo	Centaury, cut	8021302	1
Caelo	Ceylon cinnamon, fine…	abcdef	1
Caelo	Ceylonese Cinnamon, p…	12242806	2
Caelo	Ceylonese Cinnamon, p…	12242815	1
Caelo	Ceylonese Cinnamon, p…	11306016	1
Caelo	Ceylonese Cinnamon, p…	12242818	1
Caelo	Chelidonium majus her…	311092	1
Caelo	Chickweed, cut	13254404	1
Caelo	Chickweed, cut	13040503	1
Caelo	Chickweed, cut	13040502-3283310662	1
Caelo	Chickweed, cut	13040502	2
Caelo	Chickweed, cut	13254403	2
Caelo	Chickweed, cut	13254401	1
Caelo	Chickweed, cut	13040504	1
Caelo	Chickweed, cut	10359116	1
Caelo	Chickweed, cut	14212403	1
Caelo	Chickweed, cut	13040501	1
Caelo	Chickweed, cut	14212411	1

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Supplier	Substance	Batch	Spectra
Caelo	Chickweed, cut	10359117	2
Caelo	Chickweed, cut	4551B130902	1
Caelo	Chickweed, cut	211e-01686	1
Caelo	Chicory herb, cut	14031315	1
Caelo	Chicory herb, cut	12369102	3
Caelo	Chicory herb, cut	10325606	1
Caelo	Chicory herb, cut	12369101	6
Caelo	Chicory herb, cut	12354306	1
Caelo	Chicory herb, cut	12354304	1
Caelo	Chicory herb, cut	12354302	5
Caelo	Chicory herb, cut	12034301	4
Caelo	Chicory herb, cut	12034303	4
Caelo	Chicory herb, cut	nachprüfung	1
Caelo	Chicory herb, cut	12034302	3
Caelo	Chicory root, cut	11374504	3
Caelo	Chicory root, cut	11374506	2
Caelo	Chicory root, cut	6221As101202	1
Caelo	Chicory root, cut	11374510	2
Caelo	Chicory root, cut	913Q-02134	1
Caelo	Chicory root, cut	11081803	1
Caelo	Chicory root, cut	91338319	1
Caelo	Cinchona bark, cut	14009305	1
Caelo	Cinchona bark, cut	11238512	1
Caelo	Cinchona bark, cut	10381906	1
Caelo	Cinnamon rods (Ceylon…	13231601	2
Caelo	Cinnamon rods (Ceylon…	12148904	1
Caelo	Cinnamon, cut	11357909	2
Caelo	Cinnamon, cut	15151902	1
Caelo	Cinnamon, cut	11357912	2
Caelo	Cinnamon, cut	12309908	1
Caelo	Cinnamon, cut	12309909	1
Caelo	Cinnamon, cut	13231603	1
Caelo	Cinnamon, cut	13304407	1
Caelo	Cinnamon, cut	13304409	1
Caelo	Cinnamon, cut	13304415	1
Caelo	Cinnamon, cut	13304414	1
Caelo	Cinnamon, cut	13304401	2
Caelo	Cinnamon, cut	12309902	3
Caelo	Cinnamon, cut	15151905	1
Caelo	Cinnamon, cut	25111307	1
Caelo	Cinnamon, cut	13304402	2
Caelo	Clove	12266505	1
Caelo	Clove	12095807	5
Caelo	Clove	13371306	1
Caelo	Clove	12095806	2
Caelo	Clove	14057602	1
Caelo	Clove	11233305	1
Caelo	Clove	12095802	1
Caelo	Clove	13371309	1
Caelo	Clove	5398872	1
Caelo	Clove	2010i-01450	1
Caelo	Clove, powdered (spice)	14180001	1
Caelo	Clove, powdered (spice)	12355303	1
Caelo	Cocaine hydrochloride	13259306	1
Caelo	Cocaine hydrochloride	13112102	1
Caelo	Cocaine hydrochloride	C17H22CIN04	1
Caelo	Cocaine hydrochloride	12329103	1
Caelo	Cocaine hydrochloride	17003902	1
Caelo	Cocaine hydrochloride	16142705	1
Caelo	Cocaine hydrochloride	13259305	1

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Supplier	Substance	Batch	Spectra
Caelo	Cocaine hydrochloride	14069209	1
Caelo	Cocoa bark, cut	12126910	1
Caelo	Cocoa bark, cut	19011303	1
Caelo	Cocoa bark, cut	12126907	1
Caelo	Cocoa bark, cut	12126905	2
Caelo	Cocoa bark, cut	12126901	1
Caelo	Cocoa bark, cut	nachprüfung	1
Caelo	Cocoa bark, cut	1216907	1
Caelo	Codeine phosphate hem…	13G03-N10	1
Caelo	Codeine phosphate hem…	16349706	1
Caelo	Codeine phosphate hem…	15219805	1
Caelo	Codeine phosphate hem…	15350703	2
Caelo	Codeine phosphate hem…	1427910	1
Caelo	Codeine phosphate hem…	14275910	1
Caelo	Coltsfoot leaf, cut	23041302	1
Caelo	Coltsfoot leaf, cut	2021B130227	16
Caelo	Coltsfoot leaf, cut	2021B121204	16
Caelo	Coltsfoot leaf, cut	25021304	1
Caelo	Coltsfoot leaf, cut	Int.Ch:Now16081	1
Caelo	Comfrey root	2711Q-02135	1
Caelo	Comfrey root	4112E-02135	1
Caelo	Comfrey root	116053	1
Caelo	Common broom herb, cut	12358802	1
Caelo	Common broom herb, cut	12358805	1
Caelo	Common broom herb, cut	13241601	1
Caelo	Common broom herb, cut	4412Q-01680	1
Caelo	Common broom herb, cut	11132209	1
Caelo	Common broom herb, cut	12358804	3
Caelo	Common wormwood herb,…	4712A-01620	1
Caelo	Common wormwood herb,…	3591A100315	1
Caelo	Common wormwood herb,…	18031302	1
Caelo	Common wormwood herb,…	14360605	1
Caelo	Common wormwood herb,…	12382706	1
Caelo	Common wormwood herb,…	12382705	2
Caelo	Common wormwood herb,…	12382702	11
Caelo	Common wormwood herb,…	12382701	8
Caelo	Common wormwood herb,…	12016711	4
Caelo	Common wormwood herb,…	12016709	3
Caelo	Common wormwood herb,…	12016701	1
Caelo	Common wormwood herb,…	1238701	1
Caelo	Common wormwood herb,…	10357806	1
Caelo	Common wormwood herb,…	10355329	1
Caelo	Common wormwood herb,…	12016702	2
Caelo	Common wormwood herb,…	9355403	1
Caelo	Common wormwood herb,…	1081301	1
Caelo	Common wormwood herb,…	3591A110119	4
Caelo	Common wormwood herb,…	12016705	9
Caelo	Copper (II) sulfate p…	3411M-01317	1
Caelo	Copper (II) sulfate p…	12135001	1
Caelo	Copper (II) sulfate p…	12157107	1
Caelo	Copper (II) sulfate p…	3211M-01317	1
Caelo	Copper (II) sulfate p…	2913U-01317	1
Caelo	Copper (II) sulfate p…	10L15-NO6	1
Caelo	Coriander	16010201	1
Caelo	Coriander	13010306	2
Caelo	Coriander	12080905	1
Caelo	Coriander	14031316	1
Caelo	Coriander	27061305	1
Caelo	Coriander	12080906	2
Caelo	Coriander	9285707	1

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Supplier	Substance	Batch	Spectra
Caelo	Coriander	12080901	2
Caelo	Coriander	4091305	1
Caelo	Coriander	13010304	2
Caelo	Cottonwood bud	nachprüfung	1
Caelo	Cottonwood bud	12027504	1
Caelo	Cottonwood bud	12027506	1
Caelo	Cottonwood bud	70864257	1
Caelo	Couch grass rhizome, ...	12186817	3
Caelo	Couch grass rhizome, ...	12186705	1
Caelo	Couch grass rhizome, ...	12186701	1
Caelo	Couch grass rhizome, ...	10349705	2
Caelo	Couch grass rhizome, ...	10349704	1
Caelo	Couch grass rhizome, ...	nachprüfung	1
Caelo	Couch grass rhizome, ...	10049606	1
Caelo	Couch grass rhizome, ...	10049614	1
Caelo	Couch grass rhizome, ...	10049618	2
Caelo	Couch grass rhizome, ...	3712I-02180	1
Caelo	Cowberry leaf, cut	11334302	1
Caelo	Cowberry leaf, cut	12105201	1
Caelo	Cowberry leaf, cut	12105203	1
Caelo	Cowberry leaf, cut	12150205	1
Caelo	Daisy flower	12133705	1
Caelo	Daisy flower	12133703	1
Caelo	Daisy flower	1210a120215	2
Caelo	Daisy flower	11103203	3
Caelo	Daisy flower	11103201	2
Caelo	Daisy flower	11068308	1
Caelo	Damiana leaf, cut	12330407	2
Caelo	Damiana leaf, cut	11026607	2
Caelo	Damiana leaf, cut	12330402	10
Caelo	Damiana leaf, cut	12064103	3
Caelo	Damiana leaf, cut	12330403	2
Caelo	Damiana leaf, cut	12330401	4
Caelo	Dandelion herb with r...	7131-02165	1
Caelo	Dandelion herb with r...	11030314	6
Caelo	Dandelion herb with r...	Ch.-B.:13019802	1
Caelo	Dandelion herb with r...	13199202	2
Caelo	Dandelion herb with r...	13317903	1
Caelo	Dandelion herb with r...	17121305	1
Caelo	Dandelion herb with r...	20111202	1
Caelo	Dandelion herb with r...	13019805	3
Caelo	Dandelion herb with r...	13019801	6
Caelo	Dandelion herb with r...	13018902	1
Caelo	Dandelion herb with r...	12252101	1
Caelo	Dandelion herb with r...	12236005	7
Caelo	Dandelion herb with r...	12236003	5
Caelo	Dandelion herb with r...	12236002	10
Caelo	Dandelion herb with r...	12236001	4
Caelo	Dandelion herb with r...	Int.Ch:318090	1
Caelo	Dandelion herb with r...	11371903	1
Caelo	Dandelion herb with r...	11030313	3
Caelo	Dandelion herb with r...	2112122165	1
Caelo	Dandelion herb with r...	11030309	5
Caelo	Dandelion herb with r...	1103011	1
Caelo	Dandelion herb with r...	10121610	1
Caelo	Dandelion herb with r...	13019802	24
Caelo	Dandelion herb with r...	10121602	1
Caelo	Dandelion herb with r...	13019802-3395310101	1
Caelo	Dandelion herb with r...	8111205	1
Caelo	Dandelion herb with r...	806212165	1

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Supplier	Substance	Batch	Spectra
Caelo	Dandelion herb with r...	7341703	1
Caelo	Dandelion herb with r...	6611B100902	1
Caelo	Dandelion herb with r...	13108802	13
Caelo	Dandelion herb with r...	13108801	4
Caelo	Dandelion herb withou...	7031305	1
Caelo	Dandelion herb withou...	1127102	1
Caelo	Dandelion herb withou...	11217109	2
Caelo	Dandelion herb withou...	107063	1
Caelo	Dandelion herb withou...	9011403	1
Caelo	Dandelion herb withou...	11217107	1
Caelo	Dandelion herb withou...	11371902	2
Caelo	Dandelion herb withou...	11371904	3
Caelo	Dandelion herb withou...	11371907	1
Caelo	Dandelion herb withou...	1137907	1
Caelo	Dandelion herb withou...	13091305	1
Caelo	Dandelion herb withou...	11030311	1
Caelo	Dandelion root, cut	11003308	2
Caelo	Dandelion root, cut	11003307	1
Caelo	Dandelion root, cut	10024710	1
Caelo	Dandelion root, cut	16161308	1
Caelo	Dandelion root, cut	16161303	1
Caelo	Dandelion root, cut	13329704	1
Caelo	Dandelion root, cut	14376602	1
Caelo	Dandelion root, cut	12367916	1
Caelo	Dandelion root, cut	13329705	1
Caelo	Dandelion root, cut	14166501	1
Caelo	Dandelion root, cut	14166502	1
Caelo	Dandelion root, cut	14166504	1
Caelo	Dandelion root, cut	15407703	1
Caelo	Dandelion root, cut	13329702	10
Caelo	Dandelion root, cut	14376603	1
Caelo	Dandelion root, cut	12363107	1
Caelo	Dandelion root, cut	6621A-120606	1
Caelo	Dandelion root, cut	12363110	1
Caelo	Dandelion root, cut	12363109	4
Caelo	Dandelion root, cut	12363108	2
Caelo	Dandelion root, cut	8120	1
Caelo	Dandelion root, cut	12363106	1
Caelo	Dandelion root, cut	15407703	3
Caelo	Dandelion root, cut	12363105	1
Caelo	Dandelion root, cut	12363103	1
Caelo	Dandelion root, cut	12363102	3
Caelo	Dandelion root, cut	1225101	1
Caelo	Dandelion root, cut	11003312	1
Caelo	Dandelion root, cut	11003309	1
Caelo	Dandelion root, cut	11003306	1
Caelo	Dandelion root, cut	12363104	4
Caelo	Dandelion root, cut	14166504	1
Caelo	Devil's claw root	6331B110426	2
Caelo	Devil's claw root	12031811	1
Caelo	Devil's claw root	12031801	1
Caelo	Devil's claw root	12031803	2
Caelo	Devil's claw root	12031806	1
Caelo	Devil's claw root	12031810	1
Caelo	Dexamphetamine sulfate	C9H13N14	1
Caelo	Dihydrocodeine hydrog...	15295903	2
Caelo	Dihydrocodeine hydrog...	15295905	2
Caelo	Dihydrocodeine hydrog...	15295907	1
Caelo	Dihydrocodeine hydrog...	12142508	2
Caelo	Dihydrocodeine hydrog...	13267608	1

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Supplier	Substance	Batch	Spectra
Caelo	Dihydrocodeine hydrog…	13267604	2
Caelo	Dihydrocodeine hydrog…	13267603	1
Caelo	Dihydrocodeine hydrog…	12142503	2
Caelo	Dill fruit	9189003	1
Caelo	Dill fruit	12038302	2
Caelo	Dill fruit	12038304	4
Caelo	Dill fruit	12342901	3
Caelo	Dill fruit	12342909	5
Caelo	Dill fruit	12289901	1
Caelo	Dill fruit	16348701	1
Caelo	Dill fruit	12342904	6
Caelo	Dill fruit	12342906	3
Caelo	Dill fruit	12342908	3
Caelo	Dill fruit	2413M-01526	1
Caelo	Dill fruit	12342903	1
Caelo	Dill herb, cut	13007608	1
Caelo	Dill herb, cut	13007601	1
Caelo	Dill herb, cut	13007602	1
Caelo	Dill herb, cut	11295109	1
Caelo	Dill herb, cut	13007605	1
Caelo	Dithranol	12375403	1
Caelo	Dithranol	120145041.2013	1
Caelo	Dithranol	120302501	1
Caelo	Dithranol	120302502	2
Caelo	Dithranol	1212I-01274	1
Caelo	Dithranol	12236811	4
Caelo	Dithranol	12375302	4
Caelo	Dithranol	12375305	1
Caelo	Dithranol	12375402	1
Caelo	Dithranol	12014504	2
Caelo	Dithranol	13120503	1
Caelo	Dithranol	13120504	1
Caelo	Dithranol	13120702	1
Caelo	Dithranol	27111206	1
Caelo	Dithranol	APDT/3652011D	1
Caelo	Dithranol	11064501	1
Caelo	Dithranol	12014502	1
Caelo	Dithranol	13120502	1
Caelo	Dithranol	12375601	1
Caelo	Dithranol	12236809	1
Caelo	Dry beads Caelo ora…	11005811	1
Caelo	Dry beads Caelo ora…	11005813	1
Caelo	Dry beads Caelo ora…	12382204	1
Caelo	Echinacea pallida roo…	12244504	1
Caelo	Echinacea pallida roo…	11115206	1
Caelo	Elder berries	12267801	1
Caelo	Elder flower, rubbed	12221910	4
Caelo	Elder flower, rubbed	12221907	4
Caelo	Elder flower, rubbed	12221906	1
Caelo	Elder flower, rubbed	12221905	9
Caelo	Elder flower, rubbed	12221903	1
Caelo	Elder flower, rubbed	10291312	4
Caelo	Elder flower, rubbed	10291212	1
Caelo	Elder flower, rubbed	10291310	6
Caelo	Elder flower, rubbed	10291308	2
Caelo	Elder flower, rubbed	12221904	12
Caelo	Elder flower, rubbed	12221904-3360319071	1
Caelo	Elder flower, rubbed	9297412	1
Caelo	Elder flower, rubbed	9297417	2
Caelo	Elder flower, rubbed	10291301	1

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Supplier	Substance	Batch	Spectra
Caelo	Elder flower, rubbed	10291304	1
Caelo	Elder flower, rubbed	213E-01471	1
Caelo	Elder flower, rubbed	12221902	10
Caelo	Elder flower, rubbed	5122013d	1
Caelo	Elder flower, rubbed	1029310	1
Caelo	Elder flower, rubbed	15085301	1
Caelo	Elder flower, rubbed	25091207	1
Caelo	Elder flower, rubbed	15085314	1
Caelo	Elder flower, rubbed	31051301	1
Caelo	Elder flower, rubbed	13244601	4
Caelo	Elder flower, rubbed	13244602	4
Caelo	Elder flower, rubbed	14111317	1
Caelo	Elder flower, rubbed	13244604	1
Caelo	Elder flower, rubbed	13244606	1
Caelo	Elder flower, rubbed	13244610	1
Caelo	Elder root, cut	12345678	1
Caelo	Elecampane rhizome, cut	13152401	1
Caelo	Elecampane rhizome, cut	11374703	1
Caelo	Elecampane rhizome, cut	1211334	1
Caelo	Elecampane rhizome, cut	12113304	3
Caelo	Elecampane rhizome, cut	11374702	1
Caelo	Elecampane rhizome, cut	13152402	1
Caelo	Elecampane rhizome, cut	13152403	2
Caelo	Eleutherococcus, cut	12326707	1
Caelo	Eleutherococcus, cut	12326703	1
Caelo	Eleutherococcus, cut	12326701	2
Caelo	Eleutherococcus, cut	10381814	2
Caelo	Eleutherococcus, cut	10381808	1
Caelo	Eleutherococcus, cut	10381818	2
Caelo	Eleutherococcus, cut	10381817	2
Caelo	Eleutherococcus, cut	10381812	2
Caelo	Elm bark, cut	10347204	1
Caelo	Elm bark, cut	10347203	1
Caelo	Elm bark, cut	12287902	4
Caelo	Equisetum stem, cut	8101201	1
Caelo	Equisetum stem, cut	9101313	1
Caelo	Equisetum stem, cut	10328901	1
Caelo	Equisetum stem, cut	13200201	1
Caelo	Equisetum stem, cut	10375520	1
Caelo	Equisetum stem, cut	11021902	1
Caelo	Equisetum stem, cut	11021903	1
Caelo	Equisetum stem, cut	11021904	6
Caelo	Equisetum stem, cut	11076301	5
Caelo	Equisetum stem, cut	11076303	16
Caelo	Equisetum stem, cut	10375507	3
Caelo	Equisetum stem, cut	8051302	1
Caelo	Equisetum stem, cut	13159705	7
Caelo	Equisetum stem, cut	8041301	1
Caelo	Equisetum stem, cut	613M-01642	1
Caelo	Equisetum stem, cut	6081304	1
Caelo	Equisetum stem, cut	13344303	9
Caelo	Equisetum stem, cut	13159706	7
Caelo	Equisetum stem, cut	13159705-3387310190	1
Caelo	Equisetum stem, cut	3091201	1
Caelo	Equisetum stem, cut	2011408	1
Caelo	Equisetum stem, cut	13159702-3464312101	1
Caelo	Equisetum stem, cut	1035515	1
Caelo	Equisetum stem, cut	12268801	1
Caelo	Equisetum stem, cut	12288801	15
Caelo	Equisetum stem, cut	1228803	1

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Supplier	Substance	Batch	Spectra
Caelo	Equisetum stem, cut	12288803	19
Caelo	Equisetum stem, cut	17101203	1
Caelo	Equisetum stem, cut	12231401	14
Caelo	Equisetum stem, cut	13350301	1
Caelo	Equisetum stem, cut	13344315	1
Caelo	Equisetum stem, cut	13344313	1
Caelo	Equisetum stem, cut	13344311	1
Caelo	Equisetum stem, cut	13344306	1
Caelo	Equisetum stem, cut	13350309	1
Caelo	Equisetum stem, cut	13344305	2
Caelo	Equisetum stem, cut	13344302	3
Caelo	Equisetum stem, cut	13159704	7
Caelo	Equisetum stem, cut	13159702	10
Caelo	Equisetum stem, cut	13153702	1
Caelo	Equisetum stem, cut	13091301	1
Caelo	Equisetum stem, cut	1288804	1
Caelo	Equisetum stem, cut	13344304	5
Caelo	Equisetum stem, cut		3
Caelo	Equisetum stem, cut	1359702	1
Caelo	Equisetum stem, cut	15015402	2
Caelo	Equisetum stem, cut	2613E-01642	1
Caelo	Equisetum stem, cut	11021901	2
Caelo	Equisetum stem, cut	10375505	2
Caelo	Equisetum stem, cut	10328915	1
Caelo	Equisetum stem, cut	311042	1
Caelo	Equisetum stem, cut	30101305	1
Caelo	Equisetum stem, cut	11076307	3
Caelo	Equisetum stem, cut	282573	1
Caelo	Equisetum stem, cut	20111212	1
Caelo	Equisetum stem, cut	12288802	3
Caelo	Equisetum stem, cut	11076302	4
Caelo	Equisetum stem, cut	11076306	8
Caelo	Equisetum stem, cut	17011308	1
Caelo	Equisetum stem, cut	15015404	1
Caelo	Equisetum stem, cut	2658181	1
Caelo	Equisetum stem, cut	12288809	3
Caelo	Equisetum stem, cut	13344309	5
Caelo	Equisetum stem, cut	12288804	12
Caelo	Equisetum stem, cut	12288808	10
Caelo	Eucalyptus leaf, cut	122250204	1
Caelo	Eucalyptus leaf, cut	12225203	3
Caelo	Eucalyptus leaf, cut	12225202	1
Caelo	Eucalyptus leaf, cut	11307708	2
Caelo	Eucalyptus leaf, cut	11307706	1
Caelo	Eucalyptus leaf, cut	12225206	1
Caelo	Eucalyptus leaf, cut	11307705	2
Caelo	Eucalyptus leaf, cut	9346812	1
Caelo	Eucalyptus leaf, cut	9346807	1
Caelo	Eucalyptus leaf, cut	11307703	3
Caelo	Eucalyptus leaf, cut	9346811	3
Caelo	Euphrasy herb, cut	12103203	9
Caelo	Euphrasy herb, cut	29011302	1
Caelo	Euphrasy herb, cut	30101307	1
Caelo	Euphrasy herb, cut	312052	1
Caelo	Euphrasy herb, cut	9311411	1
Caelo	Euphrasy herb, cut	1213202	1
Caelo	Euphrasy herb, cut	12103201	1
Caelo	Euphrasy herb, cut	13180002	4
Caelo	Euphrasy herb, cut	11030811	3
Caelo	Euphrasy herb, cut	11030810	1

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Supplier	Substance	Batch	Spectra
Caelo	Euphrasy herb, cut	13180001	5
Caelo	Euphrasy herb, cut	8011419	1
Caelo	Euphrasy herb, cut	13180005	2
Caelo	Euphrasy herb, cut	13180008	1
Caelo	Euphrasy herb, cut	11030812	4
Caelo	Euphrasy herb, cut	7051302	1
Caelo	Euphrasy herb, cut	13180004	6
Caelo	Euphrasy herb, cut	14019102	2
Caelo	Euphrasy herb, cut	14019107	1
Caelo	Euphrasy herb, cut	12103202	10
Caelo	Euphrasy herb, cut	112211643	1
Caelo	European golden rod, ...	12343103-3466312121	1
Caelo	European golden rod, ...	12343102	1
Caelo	European golden rod, ...	13386908	1
Caelo	Fenugreek	13013802	2
Caelo	Fenugreek	12252603	2
Caelo	Fenugreek	4912E-02803	1
Caelo	Fenugreek	11313204	4
Caelo	Fenugreek	11313205	1
Caelo	Fenugreek	1131206	1
Caelo	Fenugreek	10220701	1
Caelo	Fenugreek	13013805	3
Caelo	Fenugreek	12252601	2
Caelo	Fenugreek	13013803	7
Caelo	Fenugreek	11313203	3
Caelo	Fenugreek	13013801	2
Caelo	Fenugreek, powdered	12149605	1
Caelo	Fenugreek, powdered	14377201	2
Caelo	Fenugreek, powdered	14057807	1
Caelo	Fenugreek, powdered	14057801	1
Caelo	Fenugreek, powdered	13398302	1
Caelo	Fenugreek, powdered	15308703	2
Caelo	Fenugreek, powdered	7264a110201	2
Caelo	Fenugreek, powdered	12149607	2
Caelo	Ferric (III) sulfate ...	10354412	1
Caelo	Ferric (III) sulfate ...	10354404	2
Caelo	Ferric (III) sulfate ...	12175906	3
Caelo	Ferric (III) sulfate ...	1512210007	2
Caelo	Ferric (III) sulfate ...	12175908	1
Caelo	Ferric (III) sulfate ...	10354415	1
Caelo	Feverfew herb, cut	12380203	6
Caelo	Feverfew herb, cut	12380204	1
Caelo	Flax weed herb, cut	14005305	3
Caelo	Flax weed herb, cut	11104507	11
Caelo	Flax weed herb, cut	13007507	7
Caelo	Flax weed herb, cut	13007505	2
Caelo	Flax weed herb, cut	13007502	3
Caelo	Flax weed herb, cut	11104505	1
Caelo	Flax weed herb, cut	16292801	1
Caelo	Flax weed herb, cut	14005303	1
Caelo	Flax weed herb, cut	14197204	1
Caelo	Frangula bark, cut	12186001	1
Caelo	Frangula bark, cut	12186002	17
Caelo	Frangula bark, cut	12186003	1
Caelo	Frangula bark, cut	12186004	12
Caelo	Frangula bark, cut	6011402	1
Caelo	Frangula bark, cut	12186005	1
Caelo	Frangula bark, cut	12186006	6
Caelo	Frangula bark, cut	1286003	1
Caelo	Frangula bark, cut	13203008	2

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Supplier	Substance	Batch	Spectra
Caelo	Frangula bark, cut	14163102	1
Caelo	Frangula bark, cut	121860006	1
Caelo	Frangula bark, cut	eztetdt	1
Caelo	Frangula bark, cut	12185901	9
Caelo	Frangula bark, cut	11340801	1
Caelo	Frangula bark, cut	11254001	3
Caelo	Frangula bark, cut	10061301	1
Caelo	Frankincense	15140804	1
Caelo	Frankincense	14107803	2
Caelo	Frankincense	1210001	1
Caelo	Frankincense	13112807	1
Caelo	Frankincense	4614M-02030	1
Caelo	Frankincense	13112803-3494411030	1
Caelo	Frankincense	12120012-3421310191	1
Caelo	Frankincense	12120005	5
Caelo	Frankincense	15140809	1
Caelo	Frankincense	13112809	2
Caelo	Frankincense	13112801	5
Caelo	Frankincense	13112803	1
Caelo	Frankincense	12120008	2
Caelo	Frankincense	15140810	1
Caelo	Frankincense	1210005	1
Caelo	Frankincense	10349210	1
Caelo	Frankincense	12120007	1
Caelo	Frankincense	12120006	3
Caelo	Frankincense	100546	1
Caelo	Frankincense	15140805	2
Caelo	Fraxinella root, cut	11314702	1
Caelo	Fumitory, cut	12103405	10
Caelo	Fumitory, cut	11101406	2
Caelo	Fumitory, cut	12103404	3
Caelo	Fumitory, cut	12103406	3
Caelo	Fumitory, cut	12103407	7
Caelo	Fumitory, cut	12103408	5
Caelo	Fumitory, cut	13202901	2
Caelo	Fumitory, cut	13202902	15
Caelo	Fumitory, cut	13202905	2
Caelo	Fumitory, cut	1320902	2
Caelo	Fumitory, cut	31081201	1
Caelo	Fumitory, cut	72878477	1
Caelo	Fumitory, cut	12103401	2
Caelo	Fumitory, cut	1110145	1
Caelo	Fumitory, cut	11101408	1
Caelo	Fumitory, cut	111011411	1
Caelo	Fumitory, cut	8312901	1
Caelo	Fumitory, cut	7111201	1
Caelo	Fumitory, cut	11101413	5
Caelo	Fumitory, cut	11101411	5
Caelo	Fumitory, cut	11101410	2
Caelo	Fumitory, cut	11101405	2
Caelo	Fumitory, cut	12103402	5
Caelo	Galangal root	12330303	1
Caelo	Galangal root	12125004	3
Caelo	Galangal root	13341105	1
Caelo	Galangal root	11375904	1
Caelo	Galangal root	15128008	1
Caelo	Galangal root	12330306	2
Caelo	Galangal root	1215004	1
Caelo	Galangal root	12330305	2
Caelo	Garden violet, cut	13038703	3

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Supplier	Substance	Batch	Spectra
Caelo	Garden violet, cut	10291007	1
Caelo	Garden violet, cut	11124007	1
Caelo	Garden violet, cut	13038701	4
Caelo	Garden violet, cut	13232107	1
Caelo	Garden violet, cut	10011403	1
Caelo	Garden violet, cut	1021308	1
Caelo	Garden violet, cut	1303872	1
Caelo	Garden violet, cut	11124007-3284310662	1
Caelo	Garden violet, cut	11124008	2
Caelo	Gentian root, cut	Nachprüfung	1
Caelo	Gentian root, cut	10263405	1
Caelo	Gentian root, cut	Int.Ch:313091	1
Caelo	Gentian root, cut	3311i-02142	1
Caelo	Gentian root, cut	10263413	1
Caelo	Gentian root, cut	30011301	1
Caelo	Gentian root, cut	2913A-02142	1
Caelo	Gentian root, cut	19071304	1
Caelo	Gentian root, cut	13156102	1
Caelo	Gentian root, cut	1244603	1
Caelo	Gentian root, cut	12244608	1
Caelo	Gentian root, cut	12244607	1
Caelo	Gentian root, cut	6311B130305	3
Caelo	Gentian root, cut	10263411	4
Caelo	Gentian root, cut	10263406	1
Caelo	Gentian root, cut	10263404	2
Caelo	Gentian root, cut	10263403	1
Caelo	Gentian root, cut	10263401	1
Caelo	Gentian root, powdered	12007106	1
Caelo	Ginger, peeled	13310604	3
Caelo	Ginger, peeled	19121201	1
Caelo	Ginger, peeled	13310602	2
Caelo	Ginger, peeled	13100602	2
Caelo	Ginger, peeled	13100604	1
Caelo	Ginger, peeled	13100605	4
Caelo	Ginger, peeled	12164911-3368319002	1
Caelo	Ginger, peeled	11325712	1
Caelo	Ginger, peeled	11325715	2
Caelo	Ginger, peeled	11325716	1
Caelo	Ginger, peeled	11325706	1
Caelo	Ginger, peeled	12180604	1
Caelo	Ginger, peeled	11325713	1
Caelo	Ginger, peeled	11325719	3
Caelo	Ginger, peeled	11325703	2
Caelo	Ginger, peeled, powde…	12164901	1
Caelo	Ginger, peeled, powde…	13092013B	1
Caelo	Ginger, peeled, powde…	12164911	1
Caelo	Ginkgo leaf, cut	13340906	1
Caelo	Ginkgo leaf, cut	12121703	1
Caelo	Ginkgo leaf, cut	12151703	1
Caelo	Ginkgo leaf, cut	13340901	1
Caelo	Ginkgo leaf, cut	13340904	1
Caelo	Ginkgo leaf, cut	10315510	1
Caelo	Ginkgo leaf, cut	15077407	1
Caelo	Ginkgo leaf, cut	12151707	2
Caelo	Ginkgo leaf, cut	12151709	2
Caelo	Ginkgo leaf, cut	1513E-02841	1
Caelo	Ginkgo leaf, cut	nachprüfung	1
Caelo	Ginkgo leaf, cut	13340907	1
Caelo	Ginseng root	12080218	1
Caelo	Ginseng root	13341001	1

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Supplier	Substance	Batch	Spectra
Caelo	Goat's rue, cut	12017912	1
Caelo	Goat's rue, cut	11307901	1
Caelo	Goat's rue, cut	5122013e	1
Caelo	Goat's rue, cut	6061203	1
Caelo	Goat's rue, cut	11175104	1
Caelo	Goat's rue, cut	12017903	1
Caelo	Goat's rue, cut	11307903	2
Caelo	Goat's rue, cut	12017913	1
Caelo	Goat's rue, cut	12017914	1
Caelo	Goat's rue, cut	12343302	4
Caelo	Goat's rue, cut	12343303	7
Caelo	Goat's rue, cut	12343305	3
Caelo	Goat's rue, cut	12343308	2
Caelo	Goat's rue, cut	33131-01645	1
Caelo	Goat's rue, cut	12017907	3
Caelo	Ground ivy herb, cut	11052315	1
Caelo	Ground ivy herb, cut	11374602	1
Caelo	Ground ivy herb, cut	11374606	1
Caelo	Ground ivy herb, cut	11374608	3
Caelo	Ground ivy herb, cut	11374615	1
Caelo	Ground ivy herb, cut	11374610	5
Caelo	Ground ivy herb, cut	11374611	1
Caelo	Ground ivy herb, cut	11052314	1
Caelo	Ground ivy herb, cut	11374609	1
Caelo	Ground ivy herb, cut	11052311	1
Caelo	Ground ivy herb, cut	3411A-01651	1
Caelo	Ground ivy herb, cut	11052318	2
Caelo	Guaiacum wood, cut	4011M-01778	1
Caelo	Guaiacum wood, cut	10143014	1
Caelo	Guaiacum wood, cut	11352001	1
Caelo	Guaiacum wood, cut	11352008	1
Caelo	Guaiacum wood, cut	11352010	1
Caelo	Guaiacum wood, cut	14008203	1
Caelo	Guaiacum wood, cut	8041401	1
Caelo	Guaiacum wood, cut	nachprüfung	1
Caelo	Guaiacum wood, cut	11352012	1
Caelo	Hamamelis bark, cut	13123703	1
Caelo	Hamamelis bark, cut	12361301	1
Caelo	Hamamelis bark, cut	12361303	1
Caelo	Hamamelis bark, cut	13123701	1
Caelo	Hamamelis bark, cut	nachprüfung	1
Caelo	Hamamelis leaf, cut	14356103	1
Caelo	Hamamelis leaf, cut	13269905	1
Caelo	Hamamelis leaf, cut	13269902	2
Caelo	Hamamelis leaf, cut	12164802	1
Caelo	Hamamelis leaf, cut	12164804	2
Caelo	Hamamelis leaf, cut	10102915	1
Caelo	Hamamelis leaf, cut	13269904	1
Caelo	Hamamelis leaf, cut	12165805	1
Caelo	Hawthorn flower	13010402	3
Caelo	Hawthorn flower	7121201	1
Caelo	Hawthorn flower	21051301	1
Caelo	Hawthorn flower	25101301	1
Caelo	Hawthorn flower	11068202	1
Caelo	Hawthorn flower	11068204	1
Caelo	Hawthorn flower	11068206	1
Caelo	Hawthorn flower	11068209	1
Caelo	Hawthorn flower	11068208	1
Caelo	Hawthorn flower	13253304	2
Caelo	Hawthorn flower	13253303	1

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Supplier	Substance	Batch	Spectra
Caelo	Hawthorn flower	13010403	5
Caelo	Hawthorn flower	13010402	2
Caelo	Hawthorn flower	11068209	3
Caelo	Hawthorn flower	11068202	1
Caelo	Hawthorn fruit	13367203	1
Caelo	Hawthorn fruit	12326307	3
Caelo	Hawthorn fruit	11278202	1
Caelo	Hawthorn fruit	13101402	1
Caelo	Hawthorn fruit	12326306	1
Caelo	Hawthorn fruit	12326304	1
Caelo	Hawthorn fruit	12326308	2
Caelo	Hawthorn leaf with fl…	10273512	2
Caelo	Hawthorn leaf with fl…	10273511	1
Caelo	Hawthorn leaf with fl…	12225103	5
Caelo	Hawthorn leaf with fl…	12225104	12
Caelo	Hawthorn leaf with fl…	12225107	6
Caelo	Hawthorn leaf with fl…	12225108	7
Caelo	Hawthorn leaf with fl…	1222514	1
Caelo	Hawthorn leaf with fl…	10273514	1
Caelo	Hawthorn leaf with fl…	2225104	1
Caelo	Hawthorn leaf with fl…	16025802	1
Caelo	Hawthorn leaf with fl…	1225107	1
Caelo	Hawthorn leaf with fl…	13276703	3
Caelo	Hawthorn leaf with fl…	1412M-01485	1
Caelo	Hawthorn leaf with fl…	1518802	1
Caelo	Hawthorn leaf with fl…	15188802	1
Caelo	Hawthorn leaf with fl…	52467476	1
Caelo	Hawthorn leaf with fl…	IntCh:313082	1
Caelo	Hawthorn leaf with fl…	10273415	1
Caelo	Hawthorn leaf with fl…	11068206	1
Caelo	Hawthorn leaf with fl…	12225207	1
Caelo	Hawthorn leaf with fl…	1221707	1
Caelo	Hawthorn leaf with fl…	109076	1
Caelo	Hay flower	12317103	1
Caelo	Hay flower	3713E-01459	1
Caelo	Hay flower	11099914	3
Caelo	Hay flower	11099912	1
Caelo	Hay flower	3713F-01459	1
Caelo	Hay flower	12317104	10
Caelo	Hay flower	12317107	12
Caelo	Hay flower	12317108	3
Caelo	Hay flower	12371707	1
Caelo	Hay flower	12317110	2
Caelo	Hay flower	13097301	1
Caelo	Hay flower	13097302	7
Caelo	Hay flower	12317102	2
Caelo	Hay flower	11099902	1
Caelo	Hay flower	11099909	3
Caelo	Hay flower	25101202	1
Caelo	Hay flower	11099910	1
Caelo	Hay flower	13099205	1
Caelo	Hay flower	13142402	1
Caelo	Hay flower	14121301	1
Caelo	Hay flower	12317101	10
Caelo	Hay flower	11099904	1
Caelo	Hay flower	13097304	1
Caelo	Hay flower	11099915	1
Caelo	Hay flower	11099916	1
Caelo	Heather flower, rubbed	13014206	1
Caelo	Heather flower, rubbed	13014204	5

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Supplier	Substance	Batch	Spectra
Caelo	Heather flower, rubbed	10270516	1
Caelo	Heather, cut	9291512	1
Caelo	Heather, cut	11011208	1
Caelo	Heather, cut	11011209	2
Caelo	Heather, cut	13367502	1
Caelo	Heather, cut	11011207	1
Caelo	Heather, cut	28061201	1
Caelo	Heather, cut	19111203	1
Caelo	Heather, cut	11102901	1
Caelo	Heavy alkaline bismut…	12146911	4
Caelo	Heavy alkaline bismut…	11052809	1
Caelo	Heavy alkaline bismut…	4513M-01186	1
Caelo	Heavy alkaline bismut…	10013208	1
Caelo	Heavy alkaline bismut…	3081205	1
Caelo	Heavy alkaline bismut…	12C08-N06	3
Caelo	Heavy alkaline bismut…	11052805	1
Caelo	Heavy alkaline bismut…	10F09-N13	1
Caelo	Heavy alkaline bismut…	10013213	1
Caelo	Heavy alkaline bismut…	12146913	3
Caelo	Heavy alkaline bismut…	11052817	1
Caelo	Heavy alkaline bismut…	11052812	2
Caelo	Heavy alkaline bismut…	M468105	1
Caelo	Heavy alkaline bismut…	12146903	7
Caelo	Heavy alkaline bismut…	12146909	4
Caelo	Heavy alkaline bismut…	12146902	1
Caelo	Heavy, basic magnesiu…	12135401	1
Caelo	Heavy, basic magnesiu…	13123502	1
Caelo	Heavy, basic magnesiu…	12135404	1
Caelo	Heavy, basic magnesiu…	2091303	1
Caelo	Heavy, basic magnesiu…	7011404	1
Caelo	Heavy, basic magnesiu…	13123505	1
Caelo	Heavy, basic magnesiu…	13123504	2
Caelo	Henna powder	12122310	3
Caelo	Henna powder	12267311	1
Caelo	Henna powder	13262803	2
Caelo	Hop strobile	12008302	3
Caelo	Hop strobile	1451B120202	8
Caelo	Hop strobile	13187602	1
Caelo	Hop strobile	12006305	1
Caelo	Hop strobile	10240410	1
Caelo	Hop strobile	10240308	1
Caelo	Hop strobile	13123808	2
Caelo	Hop strobile	12008303	1
Caelo	Hop strobile	13123807	1
Caelo	Hop strobile	12221802	2
Caelo	Hop strobile	131223805	1
Caelo	Hop strobile	12380103	1
Caelo	Hop strobile	12380102	1
Caelo	Hop strobile	14068001	1
Caelo	Hop strobile	12008312	1
Caelo	Hop strobile	120008312	1
Caelo	Hop strobile	15061211	1
Caelo	Hop strobile	12221807	1
Caelo	Hop strobile	13123802	10
Caelo	Hop strobile	13123803	8
Caelo	Hop strobile	12221804	1
Caelo	Hop strobile	13123803-3505411011	1
Caelo	Hop strobile	12008313	2
Caelo	Hop strobile	13123804-3563412081	1
Caelo	Hop strobile	12380101	8

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Supplier	Substance	Batch	Spectra
Caelo	Hop strobile	12008310	3
Caelo	Hop strobile	13220502	1
Caelo	Hop strobile	12221805	6
Caelo	Hop strobile	12008306	1
Caelo	Hop strobile	12380101	1
Caelo	Hop strobile	13123802	4
Caelo	Hop strobile	13123803	1
Caelo	Hop strobile	14068007	1
Caelo	Hop strobile	13123806	1
Caelo	Hop strobile	1451b120817	2
Caelo	Hop strobile	13123804	3
Caelo	Hop strobile	12008317	1
Caelo	Hop strobile	10036008	1
Caelo	Hop strobile	4756769	1
Caelo	Hop strobile	12008311	1
Caelo	Hop strobile	12008310	4
Caelo	Hop strobile	12008309	5
Caelo	Hop strobile	12008315	1
Caelo	Hop strobile	12008305	4
Caelo	Hop strobile	12008307	3
Caelo	Hop strobile	6091303	1
Caelo	Hop strobile	5021306	1
Caelo	Hop strobile	4111304	1
Caelo	Hop strobile	12092001	5
Caelo	Hop strobile	4212M-023337	1
Caelo	Hop strobile	30121301	1
Caelo	Hop strobile	10240320	1
Caelo	Hop strobile	12008317	7
Caelo	Horse chestnut leaf, ...	11063504	2
Caelo	Horse chestnut leaf, ...	11063503	4
Caelo	Horse chestnut leaf, ...	13126501	1
Caelo	Hydromorphone hydroch...	15393605	1
Caelo	Hydromorphone hydroch...	16123805	1
Caelo	Hyssop herb, cut	11374304	1
Caelo	Hyssop herb, cut	11374303	2
Caelo	Hyssop herb, cut	13143902	1
Caelo	Iceland moss, cut	1287102	1
Caelo	Iceland moss, cut	11101606	2
Caelo	Iceland moss, cut	11101601	1
Caelo	Iceland moss, cut	14304409	5
Caelo	Iceland moss, cut	12197002	1
Caelo	Iceland moss, cut	13350803	4
Caelo	Iceland moss, cut	11053911	1
Caelo	Iceland moss, cut	11053916	1
Caelo	Iceland moss, cut	11101502	1
Caelo	Iceland moss, cut	11101604	1
Caelo	Iceland moss, cut	nachprüfung	1
Caelo	Iceland moss, cut	1218702	1
Caelo	Iceland moss, cut	11101607	12
Caelo	Iceland moss, cut	12187106	3
Caelo	Iceland moss, cut	12187002	3
Caelo	Iceland moss, cut	14304401	1
Caelo	Iceland moss, cut	4912E-01774	2
Caelo	Iceland moss, cut	2811e-01774	1
Caelo	Iceland moss, cut	12187102	20
Caelo	Iceland moss, cut	12187104	8
Caelo	Iceland moss, cut	12198102	1
Caelo	Iceland moss, cut	15297605	1
Caelo	Iceland moss, cut	12187101	2
Caelo	Iceland moss, cut	12187109	5

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Supplier	Substance	Batch	Spectra
Caelo	Iceland moss, cut	12187107	1
Caelo	Iceland moss, cut	14304403	2
Caelo	Iceland moss, cut	12187103	1
Caelo	Iceland moss, cut	13350807	5
Caelo	Iceland moss, cut	12382806	1
Caelo	Iceland moss, cut	14304402	1
Caelo	Iceland moss, cut	9052804	2
Caelo	Ispaghula seed	3051302	1
Caelo	Ispaghula seed	15249320	1
Caelo	Ispaghula seed	10011303	1
Caelo	Ispaghula seed	9011302	1
Caelo	Ispaghula seed	4114001	1
Caelo	Ispaghula seed	23011505	1
Caelo	Ispaghula seed	413E-03369	1
Caelo	Ispaghula seed	5091319	1
Caelo	Ispaghula seed	11061405	1
Caelo	Ispaghula seed	16121302	1
Caelo	Ispaghula seed	15249313	1
Caelo	Ispaghula seed	3912Q-03369	1
Caelo	Ispaghula seed	14246603	2
Caelo	Ispaghula seed	18071301	1
Caelo	Ispaghula seed	30101302	1
Caelo	Ispaghula seed	26011401	1
Caelo	Ispaghula seed	3051303	1
Caelo	Ispaghula seed	11185803	1
Caelo	Ispaghula seed	14031408	1
Caelo	Ispaghula seed	12276501	2
Caelo	Ispaghula seed	15081503	1
Caelo	Ispaghula seed	12276511	1
Caelo	Ispaghula seed	4121202	1
Caelo	Ispaghula seed	15249319	2
Caelo	Ispaghula seed	29061510	1
Caelo	Ispaghula seed	1227506	2
Caelo	Ispaghula seed	15121902	3
Caelo	Ispaghula seed	19061308	1
Caelo	Ispaghula seed	15249315	1
Caelo	Ispaghula seed	11185811	2
Caelo	Ispaghula seed	12252709	1
Caelo	Ispaghula seed	12252706	1
Caelo	Ispaghula seed	15249308	3
Caelo	Ispaghula seed	4121201	1
Caelo	Ispaghula seed	30101303	1
Caelo	Ivy leaf, cut	410E-0149	1
Caelo	Ivy leaf, cut	8061205	1
Caelo	Ivy leaf, cut	1021306	1
Caelo	Ivy leaf, cut	2031301	1
Caelo	Ivy leaf, cut	10011401	1
Caelo	Ivy leaf, cut	4011301	1
Caelo	Ivy leaf, cut	11041304	1
Caelo	Ivy leaf, cut	23121303	1
Caelo	Ivy leaf, cut	nachprüfung	2
Caelo	Ivy leaf, cut	20111211	1
Caelo	Ivy leaf, cut	11041303	1
Caelo	Ivy leaf, cut	27111301	1
Caelo	Ivy leaf, cut	15121205	1
Caelo	Ivy leaf, cut	23121305	1
Caelo	Ivy leaf, cut	15101203	1
Caelo	Ivy leaf, cut	12225603	3
Caelo	Ivy leaf, cut	12225602	2
Caelo	Ivy leaf, cut	11229505	5

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Supplier	Substance	Batch	Spectra
Caelo	Ivy leaf, cut	11101205	1
Caelo	Ivy leaf, cut	12225605	5
Caelo	Ivy leaf, cut	25021305	1
Caelo	Jasmine flower	12143203	4
Caelo	Java tea, cut	12225704	5
Caelo	Java tea, cut	12225702	1
Caelo	Java tea, cut	11212905	2
Caelo	Java tea, cut	11212904	1
Caelo	Java tea, cut	11212901	2
Caelo	Java tea, cut	2221B121112	17
Caelo	Java tea, cut	1121905	1
Caelo	Java tea, cut	13258801	2
Caelo	Java tea, cut	13258803	1
Caelo	Java tea, cut	2221A110825	3
Caelo	Java tea, cut	13258804	3
Caelo	Java tea, cut	14121-01507	1
Caelo	Java tea, cut	20111207	1
Caelo	Java tea, cut	21061304	1
Caelo	Java tea, cut	23051203	1
Caelo	Java tea, cut	28101305	1
Caelo	Java tea, cut	31081207	1
Caelo	Java tea, cut	31121203	1
Caelo	Java tea, cut	13258802	2
Caelo	Juniper	12028604	1
Caelo	Juniper	12028601	1
Caelo	Juniper	2890a101201	3
Caelo	Juniper	12113701	1
Caelo	Juniper	12330504	1
Caelo	Juniper	12330501	1
Caelo	Juniper	12028608	1
Caelo	Juniper, pounded	13031302	1
Caelo	Juniper, pounded	13367302	1
Caelo	Juniper, pounded	14149502	1
Caelo	Kaolin, heavy	11350106	2
Caelo	Kaolin, heavy	11350125	6
Caelo	Kaolin, heavy	10176530	1
Caelo	Kaolin, heavy	11041610	1
Caelo	Kaolin, heavy	11041623	2
Caelo	Kaolin, heavy	11350107	5
Caelo	Kaolin, heavy	11350115	1
Caelo	Kaolin, heavy	13041803	2
Caelo	Kaolin, heavy	11350124	4
Caelo	Kaolin, heavy	82043269	1
Caelo	Kaolin, heavy	13041834	1
Caelo	Kaolin, heavy	13041835	3
Caelo	Kaolin, heavy	13041835	1
Caelo	Kaolin, heavy	11350107	1
Caelo	Kaolin, heavy	63033516	1
Caelo	Kaolin, heavy	10176518	1
Caelo	Kelp, cut	280172	5
Caelo	Kelp, cut	1313E-01558	1
Caelo	Kelp, cut	14071502	1
Caelo	Kelp, cut	11352209	1
Caelo	Kelp, cut	11351109	1
Caelo	Kelp, cut	11351111	1
Caelo	Kidney vetch, coarsel…	13104301	2
Caelo	Knotgrass, cut	14079304	1
Caelo	Knotgrass, cut	12368904	1
Caelo	Knotgrass, cut	12368903	1
Caelo	Knotgrass, cut	12295704	7

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Supplier	Substance	Batch	Spectra
Caelo	Knotgrass, cut	8111202	1
Caelo	Knotgrass, cut	12368902	7
Caelo	Knotgrass, cut	4312M-01674	1
Caelo	Knotgrass, cut	4301A100126	2
Caelo	Knotgrass, cut	11369301	1
Caelo	Knotgrass, cut	7102427	1
Caelo	Knotgrass, cut	12295702	3
Caelo	Ladys bedstraw herb,...	204211647	1
Caelo	Ladys bedstraw herb,...	10375702	1
Caelo	Ladys bedstraw herb,...	11265106	1
Caelo	Ladys bedstraw herb,...	12369002	3
Caelo	Ladys bedstraw herb,...	11265105	1
Caelo	Ladys bedstraw herb,...	10375703	3
Caelo	Ladys bedstraw herb,...	7011301	1
Caelo	Ladys bedstraw herb,...	12369006	6
Caelo	Ladys bedstraw herb,...	12369007	4
Caelo	Ladys bedstraw herb,...	14019202	1
Caelo	Ladys bedstraw herb,...	10375708	1
Caelo	Ladys bedstraw herb,...	15029906	1
Caelo	Ladys bedstraw herb,...	11265104	5
Caelo	Ladys bedstraw herb,...	11265103	5
Caelo	Ladys bedstraw herb,...	22041303	1
Caelo	Ladys bedstraw herb,...	2401311647	1
Caelo	Ladys bedstraw herb,...	24101201	1
Caelo	Ladys bedstraw herb,...	11265101	1
Caelo	Ladys bedstraw herb,...	11265102	11
Caelo	Ladys bedstraw herb,...	10375707	3
Caelo	Ladys bedstraw herb,...	12369001	3
Caelo	Lapacho wood, cut	19061301	1
Caelo	Lapacho wood, cut	13298308	1
Caelo	Lapacho wood, cut	11154506	1
Caelo	Lapacho wood, cut	2x11154506	1
Caelo	Lapacho wood, cut	12239305	8
Caelo	Lapacho wood, cut	12239303	2
Caelo	Lapacho wood, cut	13298305	1
Caelo	Large waybread herb, ...	123741004	1
Caelo	Large waybread herb, ...	12374101	4
Caelo	Large waybread herb, ...	9311208	1
Caelo	Large waybread herb, ...	10349603	2
Caelo	Large waybread herb, ...	10349605	2
Caelo	Large waybread herb, ...	10349610	2
Caelo	Large waybread herb, ...	10349614	1
Caelo	Large waybread herb, ...	12374106	1
Caelo	Large waybread herb, ...	13232401	2
Caelo	Large waybread herb, ...	13232404	1
Caelo	Large waybread herb, ...	14125907	1
Caelo	Laurel leaf	12299106	3
Caelo	Lavender flower	13185002	1
Caelo	Lavender flower	13159602	1
Caelo	Lavender flower	13159601	1
Caelo	Lavender flower	13336008	1
Caelo	Lavender flower	13387204	1
Caelo	Lavender flower	13185006	1
Caelo	Lavender flower	1318501	1
Caelo	Lavender flower	12088006	4
Caelo	Lavender flower	12031302	1
Caelo	Lavender flower	12088003	14
Caelo	Lavender flower	11054106	4
Caelo	Lavender flower	15061201	1
Caelo	Lavender flower	11054107	1

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Supplier	Substance	Batch	Spectra
Caelo	Lavender flower	12088005	4
Caelo	Lavender flower	13185001	28
Caelo	Lavender flower	13185001-3389311070	1
Caelo	Lavender flower	13185001-3415310152	1
Caelo	Lavender flower	13185003	11
Caelo	Lavender flower	27091202	1
Caelo	Lavender flower	12088001	1
Caelo	Lavender flower	12088002	4
Caelo	Lavender flower	15061209	1
Caelo	Lavender flower	11054104	2
Caelo	Lavender flower	6091304	1
Caelo	Lavender flower	313A-01462	1
Caelo	Lavender flower	11305403	1
Caelo	Lavender flower	11327905	2
Caelo	Lavender flower	11327903	13
Caelo	Lavender flower	19071303	1
Caelo	Lemon grass, cut	13149701	5
Caelo	Lemon grass, cut	11301501	1
Caelo	Lemon grass, cut	11301503	1
Caelo	Lemon grass, cut	13341301	1
Caelo	Lemon grass, cut	11301509	4
Caelo	Lemon grass, cut	13149703	1
Caelo	Lemon peel, cut	12217401	1
Caelo	Lemon peel, cut	12217404	1
Caelo	Lemon peel, cut	12217402	2
Caelo	Lemon verbena leaf, cut	12137505	2
Caelo	Lemon verbena leaf, cut	13037702	1
Caelo	Lemon verbena leaf, cut	12137507	4
Caelo	Lemon verbena leaf, cut	10018208	1
Caelo	Lime flower, cut	272958	7
Caelo	Lime flower, cut	13101701	6
Caelo	Lime flower, cut	12170703	2
Caelo	Lime flower, cut	12170701	1
Caelo	Lime flower, cut	1210702	1
Caelo	Lime flower, cut	11086307	3
Caelo	Lime flower, cut	11086306	1
Caelo	Lime flower, cut	12170702-3355319071	1
Caelo	Lime flower, cut	11086301	1
Caelo	Lime flower, cut	10273606	1
Caelo	Lime flower, cut	13337403	5
Caelo	Lime flower, cut	13101708	2
Caelo	Lime flower, cut	28031302	1
Caelo	Lime flower, cut	268709	4
Caelo	Lime flower, cut	11086305	8
Caelo	Lime flower, cut	9206604	1
Caelo	Lime flower, cut	25091206	1
Caelo	Lime flower, cut	13337403-348012102	1
Caelo	Lime flower, cut	Int.Ch:210140	1
Caelo	Lime flower, cut	3212M-01474	1
Caelo	Lime flower, cut	15111301	1
Caelo	Lime flower, cut	1913E-01474	1
Caelo	Lime flower, cut	15068302	1
Caelo	Lime flower, cut	13101702	9
Caelo	Lime leaf, cut	1611A121120	1
Caelo	Linseed	13296702	4
Caelo	Linseed	12321607	1
Caelo	Linseed	11199006	2
Caelo	Linseed	15006005	1
Caelo	Linseed	13412804	1
Caelo	Linseed	13296707	1

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Supplier	Substance	Batch	Spectra
Caelo	Linseed	14262906	2
Caelo	Linseed	13296705	5
Caelo	Linseed	15006601	1
Caelo	Linseed	11365504	2
Caelo	Linseed	12321604	3
Caelo	Linseed	12092103	3
Caelo	Linseed	12382002	2
Caelo	Linseed	11365507	4
Caelo	Linseed	11177305	1
Caelo	Linseed	12321601	2
Caelo	Linseed	13262702	2
Caelo	Linseed	1326703	2
Caelo	Linseed	12382004	3
Caelo	Linseed	15053702	1
Caelo	Linseed	15006605	1
Caelo	Linseed	12186901	2
Caelo	Linseed	13262704	2
Caelo	Linseed	13262703	3
Caelo	Linseed	13140305	1
Caelo	Linseed	13121207	1
Caelo	Linseed	12092102	4
Caelo	Linseed	12382006	3
Caelo	Linseed	12092104	2
Caelo	Linseed	28051303	1
Caelo	Linseed	18111302	1
Caelo	Linseed	15006602	2
Caelo	Linseed	4713U02240	1
Caelo	Linseed	16040001	1
Caelo	Linseed	16011405	1
Caelo	Linseed	1232006	1
Caelo	Linseed	12321602	4
Caelo	Linseed	15006607	1
Caelo	Linseed	7370A131104	2
Caelo	Linseed	15061201	1
Caelo	Linseed	11199003	1
Caelo	Linseed	15321902	1
Caelo	Linseed	28051403	1
Caelo	Linseed	16011403	1
Caelo	Linseed	11365508	1
Caelo	Linseed	12321606	2
Caelo	Linseed	3213A-02240	1
Caelo	Liqourice root, peeled	11351906	5
Caelo	Liqourice root, peeled	11351905	5
Caelo	Liqourice root, peeled	11351903	1
Caelo	Liqourice root, peeled	10011301	1
Caelo	Liqourice root, peeled	11351904	1
Caelo	Liqourice root, peeled	11351910	3
Caelo	Liqourice root, peeled	11351913	2
Caelo	Liqourice root, peeled	13104504	5
Caelo	Liqourice root, peeled	12227112	1
Caelo	Liqourice root, peeled	11351911	5
Caelo	Liqourice root, peeled	638a120806	1
Caelo	Liqourice root, peeled	6381A-121126	1
Caelo	Liqourice root, peeled	2413l-02151	1
Caelo	Liqourice root, peeled	18121302	1
Caelo	Liqourice root, peeled	1351911	1
Caelo	Liqourice root, peeled	277004	1
Caelo	Liqourice root, peeled	13104503	3
Caelo	Liqourice root, peeled	1135904	1
Caelo	Liqourice root, peeled	12227101	1

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Supplier	Substance	Batch	Spectra
Caelo	Liqourice root, peeled	13194101	7
Caelo	Liquorice root, natur…	281844	2
Caelo	Liquorice root, natur…	13037904	1
Caelo	Liquorice root, natur…	13037902	1
Caelo	Liquorice root, natur…	12267104	3
Caelo	Liquorice root, natur…	12267103	1
Caelo	Liquorice root, natur…		1
Caelo	Liquorice root, natur…	10110912	1
Caelo	Lovage root, cut	12189002	1
Caelo	Lovage root, cut	12189001	1
Caelo	Lovage root, cut	11181611	3
Caelo	Lovage root, cut	13385005	1
Caelo	Lovage root, cut	10249313	1
Caelo	Lovage root, cut	12169003	1
Caelo	Lovage root, cut	12169009	1
Caelo	Lovage root, cut	12169002	2
Caelo	Lovage root, cut	1181608	1
Caelo	Lovage root, cut	12169006	3
Caelo	Lovage root, cut	11181609	3
Caelo	Lovage root, cut	12169008	4
Caelo	Lovage root, cut	4312M-02150	1
Caelo	Lovage root, cut	12169012	1
Caelo	Lovage root, cut	12169010	2
Caelo	Lovage root, cut	107063	1
Caelo	Lungwort herb, cut	13029304	6
Caelo	Lungwort herb, cut	4331b111205	1
Caelo	Lungwort herb, cut	713M-01675	1
Caelo	Lungwort herb, cut	13355801	2
Caelo	Lungwort herb, cut	11021709	2
Caelo	Lungwort herb, cut	11134201	1
Caelo	Lungwort herb, cut	11134202	3
Caelo	Lungwort herb, cut	11134203	14
Caelo	Lungwort herb, cut	11134205	3
Caelo	Lungwort herb, cut	13029306	2
Caelo	Lungwort herb, cut	11021707	2
Caelo	Lungwort herb, cut	13029302	26
Caelo	Lycopodium herb, cut	11255017	7
Caelo	Lycopodium herb, cut	11255005	5
Caelo	Lycopodium herb, cut	11255008	16
Caelo	Lycopodium herb, cut	11255009	5
Caelo	Lycopodium herb, cut	11255010	1
Caelo	Lycopodium herb, cut	11255011	9
Caelo	Lycopodium herb, cut	11255012	2
Caelo	Lycopodium herb, cut	9378812	1
Caelo	Lycopodium herb, cut	11255016	3
Caelo	Lycopodium herb, cut	11255018	1
Caelo	Lycopodium herb, cut	13101501	1
Caelo	Lycopodium herb, cut	1310502	1
Caelo	Lycopodium herb, cut	11255001	2
Caelo	Lycopodium herb, cut	311122/1	1
Caelo	Lycopodium herb, cut	11255003	2
Caelo	Lycopodium herb, cut	11255014	7
Caelo	Magnesium chloride he…	5210I-01828	1
Caelo	Magnesium chloride he…	13194702	3
Caelo	Magnesium chloride he…	13194701	1
Caelo	Magnesium chloride he…	13194707	4
Caelo	Magnesium chloride he…	13194721	2
Caelo	Magnesium chloride he…	4013E-01828	1
Caelo	Magnesium chloride he…	1512I-01828	1
Caelo	Magnesium chloride he…	16094004	1

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Supplier	Substance	Batch	Spectra
Caelo	Magnesium chloride he…	1304C004	2
Caelo	Magnesium chloride he…	13194713	1
Caelo	Magnesium chloride he…	11345615	1
Caelo	Magnesium chloride he…	12354604	4
Caelo	Magnesium chloride he…	13194713-3490312103	1
Caelo	Magnesium chloride he…	12141808	1
Caelo	Magnesium chloride he…	12141811	2
Caelo	Magnesium chloride he…	12141814	1
Caelo	Magnesium chloride he…	12354605	5
Caelo	Magnesium chloride he…	12354606	5
Caelo	Magnesium chloride he…	12354618	2
Caelo	Magnesium chloride he…	12141817	3
Caelo	Magnesium chloride he…	11345624	2
Caelo	Magnesium chloride he…	12354615	9
Caelo	Magnesium chloride he…	12354613	7
Caelo	Magnesium chloride he…	12141806	2
Caelo	Magnesium chloride he…	12354610	2
Caelo	Magnesium chloride he…	11345623	2
Caelo	Magnesium chloride he…	11345609	1
Caelo	Magnesium chloride he…	11345606	1
Caelo	Magnesium chloride he…	12354608	1
Caelo	Magnesium chloride he…	1108024-01	2
Caelo	Magnesium chloride he…	9L15-N01	1
Caelo	Magnesium chloride he…	1021401	1
Caelo	Magnesium chloride he…	1.02.14	1
Caelo	Magnesium chloride he…	12354612	7
Caelo	Magnesium chloride he…	13194706	3
Caelo	Magnesium chloride he…	12354609	7
Caelo	Magnesium chloride he…	12141803	1
Caelo	Magnesium sulfate hep…	90744129	1
Caelo	Magnesium sulfate hep…	6012014B	1
Caelo	Magnesium sulfate hep…	12138516	6
Caelo	Magnesium sulfate hep…	13030107	1
Caelo	Magnesium sulfate hep…	12336915	4
Caelo	Magnesium sulfate hep…	12336914	7
Caelo	Magnesium sulfate hep…	12138521	6
Caelo	Magnesium sulfate hep…	12119901/2	1
Caelo	Magnesium sulfate hep…	11369526	18
Caelo	Magnesium sulfate hep…	11369525	7
Caelo	Magnesium sulfate hep…	11369252	1
Caelo	Magnesium sulfate hep…	10371111	1
Caelo	Magnesium sulfate hep…	11194001	1
Caelo	Magnesium sulfate hep…	1213E-01835	1
Caelo	Magnesium sulfate hep…	3612E-01835	1
Caelo	Magnesium sulfate hep…	12138522	2
Caelo	Magnesium sulfate hep…	13183702	2
Caelo	Magnesium sulfate hep…	11231005	1
Caelo	Magnesium sulfate hep…	12138515	2
Caelo	Magnesium sulfate hep…	12119906/2	1
Caelo	Magnesium sulfate hep…	113695625	1
Caelo	Magnesium sulfate hep…	1218521	2
Caelo	Magnesium sulfate hep…	12336916	3
Caelo	Magnesium sulfate hep…	11369529	1
Caelo	Magnesium sulfate hep…	10104201	1
Caelo	Magnesium sulfate hep…	11231025	2
Caelo	Magnesium sulfate hep…	11231006	2
Caelo	Magnesium sulfate hep…	12336926	3
Caelo	Magnesium sulfate hep…	11369509	1
Caelo	Magnesium sulfate hep…	13030104	1
Caelo	Magnesium sulfate hep…	12c27-n06	1

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Supplier	Substance	Batch	Spectra
Caelo	Magnesium sulfate hep…	13183709	2
Caelo	Magnesium sulfate hep…	12336942	1
Caelo	Magnesium sulfate, dr…	12157208	1
Caelo	Magnesium sulfate, dr…	M-220413-2	1
Caelo	Magnesium sulfate, dr…	11265902	1
Caelo	Magnesium sulfate, dr…	12157202	1
Caelo	Magnesium sulfate, dr…	11265908	2
Caelo	Magnesium sulfate, dr…	10213213	2
Caelo	Magnesium sulfate, dr…	12157207	1
Caelo	Magnesium sulfate, dr…	11265903	1
Caelo	Maize style, cut	10325906	8
Caelo	Maize style, cut	13381501	1
Caelo	Maize style, cut	3712Q-02333	1
Caelo	Maize style, cut	13277205	1
Caelo	Maize style, cut	11280405	11
Caelo	Maize style, cut	280363	1
Caelo	Maize style, cut	10325905	2
Caelo	Maize style, cut	10325907	4
Caelo	Maize style, cut	11280404	2
Caelo	Maize style, cut	13277201	1
Caelo	Maize style, cut	10325902	3
Caelo	Maize style, cut	10325904	2
Caelo	Maize style, cut	13277207	1
Caelo	Maize style, cut	13277202	1
Caelo	Male speedwell wort, …	13166701	4
Caelo	Male speedwell wort, …	28061303	1
Caelo	Male speedwell wort, …	14111303	1
Caelo	Male speedwell wort, …	2513A-01692	1
Caelo	Male speedwell wort, …	4661c111011	1
Caelo	Male speedwell wort, …	1216504	1
Caelo	Male speedwell wort, …	25091203	1
Caelo	Male speedwell wort, …	20111303	1
Caelo	Male speedwell wort, …	12162505	2
Caelo	Male speedwell wort, …	3091305	1
Caelo	Male speedwell wort, …	11061305	1
Caelo	Male speedwell wort, …	11265502	4
Caelo	Male speedwell wort, …	11265503	13
Caelo	Male speedwell wort, …	11265504	1
Caelo	Male speedwell wort, …	12162503	3
Caelo	Male speedwell wort, …	12162504	13
Caelo	Male speedwell wort, …	3051306	1
Caelo	Mallow flower, cut	13267301	7
Caelo	Mallow flower, cut	12187505	3
Caelo	Mallow flower, cut	12187501-3414310132	1
Caelo	Mallow flower, cut	12187404	6
Caelo	Mallow flower, cut	12187401	1
Caelo	Mallow flower, cut	11040105	1
Caelo	Mallow flower, cut	13267301-3409310112	1
Caelo	Mallow flower, cut	18111303	1
Caelo	Mallow flower, cut	9311104	1
Caelo	Mallow flower, cut	13351309	1
Caelo	Mallow flower, cut	13351307	1
Caelo	Mallow flower, cut	13351303	2
Caelo	Mallow flower, cut	13351301	3
Caelo	Mallow flower, cut	13267303	2
Caelo	Mallow flower, cut	13267302	1
Caelo	Mallow flower, cut	20061201	1
Caelo	Mallow flower, cut	13040402	1
Caelo	Mallow flower, cut	12187502	1
Caelo	Mallow flower, cut	12187501	8

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Supplier	Substance	Batch	Spectra
Caelo	Mallow flower, cut	12187405	4
Caelo	Mallow flower, cut	10357904	1
Caelo	Mallow flower, cut	8121202	1
Caelo	Mallow flower, cut	23051205	1
Caelo	Mallow flower, cut		1
Caelo	Mallow flower, cut	11040101	2
Caelo	Mallow flower, cut	27021301	1
Caelo	Mallow flower, cut	10357902	3
Caelo	Mallow flower, cut	3912E-01464	1
Caelo	Mallow flower, cut	12187402	12
Caelo	Mallow flower, cut	11040106	10
Caelo	Mallow flower, cut	Nachprüfung	1
Caelo	Mallow flower, cut	Vorführprüfung	1
Caelo	Mallow flower, cut	10357903	1
Caelo	Mallow leaf, cut	10290515	1
Caelo	Mallow leaf, cut	10290517	1
Caelo	Mallow leaf, cut	20111302	1
Caelo	Mallow leaf, cut	1412M-01501	1
Caelo	Mallow leaf, cut	12153403	1
Caelo	Mallow leaf, cut	14073902	1
Caelo	Mallow leaf, cut	13174217	1
Caelo	Mallow leaf, cut	12310009	2
Caelo	Mallow leaf, cut	13174213	1
Caelo	Mallow leaf, cut	13174207	1
Caelo	Mallow leaf, cut	12310008	1
Caelo	Mallow leaf, cut	12310006	1
Caelo	Mallow leaf, cut	12310004	5
Caelo	Mallow leaf, cut	10290510	1
Caelo	Mallow leaf, cut	3912A-01501	1
Caelo	Mallow leaf, cut	12310001	3
Caelo	Mallow leaf, cut	10290502	2
Caelo	Mallow leaf, cut	28061203	1
Caelo	Manganese sulfate mon…	91547399	1
Caelo	Manganese sulfate mon…	123825	1
Caelo	Manna, cut	1308913	1
Caelo	Manna, cut	14001315	1
Caelo	Manna, cut	11308901	2
Caelo	Manna, cut	25111301	1
Caelo	Manna, cut	2713M-01843	1
Caelo	Manna, cut	11041401	1
Caelo	Manna, cut	11061404	1
Caelo	Manna, cut	14001303	3
Caelo	Manna, cut	11308907	6
Caelo	Manna, cut	15219010	1
Caelo	Manna, cut	14001310	1
Caelo	Manna, cut	11308911	4
Caelo	Manna, cut	13127003	6
Caelo	Manna, cut	25071403	1
Caelo	Manna, cut	11308909	2
Caelo	Manna, cut	14001305	1
Caelo	Manna, cut	28101404	1
Caelo	Manna, cut	15219005	1
Caelo	Manna, cut	14001308	1
Caelo	Manna, powdered	11308907	1
Caelo	Manna, powdered	11308807	1
Caelo	Manna, powdered	14001402	1
Caelo	Manna, powdered	15101312	1
Caelo	Manna, powdered	15101306	1
Caelo	Manna, powdered	11308802	2
Caelo	Manna, powdered	11071311	1

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Supplier	Substance	Batch	Spectra
Caelo	Manna, powdered	11003611	1
Caelo	Manna, powdered	11308909	1
Caelo	Marian thistle fruit	Ch.B.:11126702	1
Caelo	Marian thistle fruit	46111-02233	1
Caelo	Marian thistle fruit	12198107	1
Caelo	Marian thistle fruit	1289112	2
Caelo	Marian thistle fruit	13326202	3
Caelo	Marian thistle fruit	15409204	2
Caelo	Marian thistle fruit	12189116	2
Caelo	Marian thistle fruit	12189115	4
Caelo	Marian thistle fruit	12189113	8
Caelo	Marian thistle fruit	12189112	14
Caelo	Marian thistle fruit	12189111	5
Caelo	Marian thistle fruit	12189108	4
Caelo	Marian thistle fruit	12189107	3
Caelo	Marian thistle fruit	12189106	4
Caelo	Marian thistle fruit	12189105	9
Caelo	Marian thistle fruit	12189104	4
Caelo	Marian thistle fruit	12189109	4
Caelo	Marian thistle fruit	1126704	1
Caelo	Marian thistle fruit	912a-02233	1
Caelo	Marian thistle fruit	10270610	3
Caelo	Marian thistle fruit	10270612	2
Caelo	Marian thistle fruit	10270613	1
Caelo	Marian thistle fruit	1126705	1
Caelo	Marian thistle fruit	10270615	4
Caelo	Marian thistle fruit	11126701,	1
Caelo	Marian thistle fruit	27111203	1
Caelo	Marian thistle fruit	10270614	5
Caelo	Marian thistle fruit	18111301	1
Caelo	Marian thistle fruit	13342003	1
Caelo	Marian thistle fruit	11126703	3
Caelo	Marian thistle fruit	11126705	3
Caelo	Marian thistle fruit	1126703	1
Caelo	Marian thistle fruit	11126701	2
Caelo	Marian thistle herb, …	10315907	1
Caelo	Marian thistle herb, …	13130701-3492411030	1
Caelo	Marian thistle herb, …	13130702	5
Caelo	Marian thistle herb, …	13130701	3
Caelo	Marian thistle herb, …	10365605	1
Caelo	Marian thistle herb, …	10365604	5
Caelo	Marian thistle herb, …	1035911	1
Caelo	Marian thistle herb, …	10365602	3
Caelo	Marian thistle herb, …	10365601	9
Caelo	Marian thistle herb, …	10315906	1
Caelo	Marian thistle herb, …	10315910	1
Caelo	Marian thistle herb, …	13130703	2
Caelo	Marian thistle herb, …	10365603	1
Caelo	Marian thistle herb, …	13386703-3543411013	1
Caelo	Marian thistle herb, …	13130704	5
Caelo	Marian thistle herb, …	1313702	1
Caelo	Marian thistle herb, …		1
Caelo	Marian thistle herb, …	10315911	5
Caelo	Marian thistle herb, …	10315909	2
Caelo	Marian thistle herb, …	30101306	1
Caelo	Marian thistle herb, …	18041303	1
Caelo	Marian thistle herb, …	17121204	1
Caelo	Marian thistle herb, …	intch:318080	1
Caelo	Marian thistle herb, …	62607127	1
Caelo	Marjoram herb, rubbed	12168907	4

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Supplier	Substance	Batch	Spectra
Caelo	Marjoram herb, rubbed	12168901	5
Caelo	Marjoram herb, rubbed	13113304	3
Caelo	Marjoram herb, rubbed	11212710	1
Caelo	Marjoram herb, rubbed	12168908	9
Caelo	Marjoram herb, rubbed	13113303	3
Caelo	Marjoram herb, rubbed	11212708	2
Caelo	Marjoram herb, rubbed	12168910	10
Caelo	Marjoram herb, rubbed	11212711	3
Caelo	Marjoram herb, rubbed	11212713	1
Caelo	Marjoram herb, rubbed	11212704	1
Caelo	Marjoram herb, rubbed	11212707	2
Caelo	Marjoram herb, rubbed	9292602	1
Caelo	Marjoram herb, rubbed	27011402	1
Caelo	Marjoram herb, rubbed	12168912	1
Caelo	Marjoram herb, rubbed	6051302	1
Caelo	Marjoram herb, rubbed	12168902	1
Caelo	Marjoram herb, rubbed	12168904	1
Caelo	Marjoram herb, rubbed	12168909	5
Caelo	Marjoram herb, rubbed	12168906	3
Caelo	Marjoram herb, rubbed	12168903	11
Caelo	Marjoram herb, rubbed	13113310	1
Caelo	Marjoram herb, rubbed	12168905	2
Caelo	Marrubium vulgare her…	12231605	4
Caelo	Marrubium vulgare her…	313091	1
Caelo	Marrubium vulgare her…	13289109	1
Caelo	Marrubium vulgare her…	12231604	5
Caelo	Marrubium vulgare her…	12231603	1
Caelo	Marrubium vulgare her…	1153803	1
Caelo	Marrubium vulgare her…	11253803	1
Caelo	Marrubium vulgare her…	11253802	1
Caelo	Marrubium vulgare her…	12231601	4
Caelo	Marshmallow leaf, cut	12328206	4
Caelo	Marshmallow leaf, cut	12328202	3
Caelo	Marshmallow leaf, cut	11101002	1
Caelo	Marshmallow leaf, cut	12328207	2
Caelo	Marshmallow root, nat…	270114	1
Caelo	Marshmallow root, pee…	11101804	2
Caelo	Marshmallow root, pee…	11101808	1
Caelo	Marshmallow root, pee…	12147311	7
Caelo	Marshmallow root, pee…	11101907	8
Caelo	Marshmallow root, pee…	11101809	1
Caelo	Marshmallow root, pee…	11101906	1
Caelo	Marshmallow root, pee…	6071A130408	14
Caelo	Marshmallow root, pee…	26091201	1
Caelo	Marshmallow root, pee…	15104503	1
Caelo	Marshmallow root, pee…	nachprüfung	1
Caelo	Marshmallow root, pee…	13057103	1
Caelo	Marshmallow root, pee…	11101905	1
Caelo	Marshmallow root, pee…	11101804	1
Caelo	Marshmallow root, pee…	12147310	1
Caelo	Marshmallow root, pee…	12147311	1
Caelo	Marshmallow root, pee…	12368906	1
Caelo	Marshmallow root, pee…	11101907	1
Caelo	Masterwort root, cut	1210801	1
Caelo	Masterwort root, cut	12101804	1
Caelo	Masterwort root, cut	13132002	1
Caelo	Masterwort root, cut	13341201	1
Caelo	Masterwort root, cut	12101806	2
Caelo	Masterwort root, cut	12101807	2
Caelo	Masterwort root, cut	12101808	1

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Supplier	Substance	Batch	Spectra
Caelo	Maté leaf, cut	12133803	3
Caelo	Maté leaf, cut	12133804	7
Caelo	Maté leaf, cut	13118001	1
Caelo	Maté leaf, cut	13118003	4
Caelo	Maté leaf, cut	11091703	1
Caelo	Maté leaf, cut	12133807	8
Caelo	Maté leaf, cut	2141A111213	18
Caelo	Maté leaf, cut	12133801	3
Caelo	Maté leaf, cut	13061202	1
Caelo	Maté leaf, cut	12133806	1
Caelo	Maté leaf, cut	11091710	1
Caelo	Matricaria flower	12294802	1
Caelo	Matricaria flower	13288405	3
Caelo	Matricaria flower	2914A-01452	1
Caelo	Matricaria flower	5081201	1
Caelo	Matricaria flower	12244803	1
Caelo	Matricaria flower	10081201	1
Caelo	Matricaria flower	IntCh:313011	1
Caelo	Matricaria flower	13210905	1
Caelo	Matricaria flower	11214805	1
Caelo	Matricaria flower	11214810	1
Caelo	Matricaria flower	121111903	1
Caelo	Matricaria flower	12111904	2
Caelo	Matricaria flower	12244802	6
Caelo	Matricaria flower	12244803	4
Caelo	Matricaria flower	11101203	1
Caelo	Matricaria flower	12244602	1
Caelo	Matricaria flower	26081303	1
Caelo	Matricaria flower	315I-01452	1
Caelo	Matricaria flower	12059606	2
Caelo	Matricaria flower	12294804	1
Caelo	Matricaria flower	12299703	2
Caelo	Matricaria flower	12337601	2
Caelo	Matricaria flower	12337607	3
Caelo	Matricaria flower	AKD5	1
Caelo	Matricaria flower	12294802	19
Caelo	Matricaria flower	11218501	1
Caelo	Matricaria flower	11169607	1
Caelo	Matricaria flower	12337608	2
Caelo	Matricaria flower	13210901-3546411013	1
Caelo	Matricaria flower	13210901-3478312171	1
Caelo	Matricaria flower	12361706	1
Caelo	Matricaria flower	13288410	1
Caelo	Matricaria flower	12361707	2
Caelo	Matricaria flower	11214802	3
Caelo	Matricaria flower	22111202	1
Caelo	Matricaria flower	13061201	1
Caelo	Matricaria flower	31051314	1
Caelo	Matricaria flower	13288403	1
Caelo	Matricaria flower	1229804	1
Caelo	Matricaria flower	13111201	1
Caelo	Matricaria flower	13210901	3
Caelo	Matricaria flower	13210903	1
Caelo	Matricaria flower	13210905	3
Caelo	Matricaria flower	13210906	1
Caelo	Matricaria flower	14276804	3
Caelo	Matricaria flower	15090003	2
Caelo	Matricaria flower	15258504	1
Caelo	Matricaria flower	13031306	1
Caelo	Matricaria flower	15258505	1

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Supplier	Substance	Batch	Spectra
Caelo	Matricaria flower	16111202	1
Caelo	Matricaria flower	12244804	2
Caelo	Matricaria flower	12361707	5
Caelo	Matricaria flower	13011406	1
Caelo	Matricaria flower	22111201	1
Caelo	Matricaria flower	12299701	1
Caelo	Matricaria flower	12361704	1
Caelo	Matricaria flower	22081202	1
Caelo	Matricaria flower	27091203	1
Caelo	Matricaria flower	17101204	1
Caelo	Matricaria flower	19041306	1
Caelo	Matricaria flower	22011303	1
Caelo	Matricaria flower	20021313	1
Caelo	Matricaria flower	19111207	1
Caelo	Matricaria flower	12361701	4
Caelo	Matricaria flower	12361706	3
Caelo	Meadowsweet flower, r…	10051301	1
Caelo	Meadowsweet flower, r…	12275701	2
Caelo	Meadowsweet flower, r…	12275703	5
Caelo	Meadowsweet flower, r…	12275704-3372319032	1
Caelo	Meadowsweet flower, r…	17121-03283	1
Caelo	Meadowsweet flower, r…	12275704	4
Caelo	Meadowsweet flower, r…	1227501	1
Caelo	Meadowsweet flower, r…	1225702	1
Caelo	Meadowsweet flower, r…	10349307	2
Caelo	Meadowsweet flower, r…	10349306	1
Caelo	Meadowsweet flower, r…	9326211	2
Caelo	Meadowsweet flower, r…	9326213	3
Caelo	Meadowsweet flower, r…	10349302	3
Caelo	Meadowsweet flower, r…	82230309	1
Caelo	Meadowsweet flower, r…	12275706	1
Caelo	Meadowsweet flower, r…	10349305	1
Caelo	Meadowsweet herb, cut	12188702	1
Caelo	Meadowsweet herb, cut	12188703	2
Caelo	Meadowsweet herb, cut	12188801	1
Caelo	Meadowsweet herb, cut	12188803	10
Caelo	Meadowsweet herb, cut	10381601	2
Caelo	Meadowsweet herb, cut	12188806	3
Caelo	Meadowsweet herb, cut	12188805	13
Caelo	Meadowsweet herb, cut	19071203	1
Caelo	Meadowsweet herb, cut	12188704	2
Caelo	Meadowsweet herb, cut	12188807	1
Caelo	Meadowsweet herb, cut	4912E-01685	1
Caelo	Meadowsweet herb, cut	62487517	1
Caelo	Melilot herb, cut	12289003	1
Caelo	Melilot herb, cut	12231703	3
Caelo	Melilot herb, cut	11307607	2
Caelo	Melilot herb, cut	11307602	2
Caelo	Melilot herb, cut	24081202	1
Caelo	Melilot herb, cut	12289206	1
Caelo	Melilot herb, cut	19071201	1
Caelo	Melilot herb, cut	8061204	1
Caelo	Melilot herb, cut	12289207	1
Caelo	Melilot herb, cut	22111303	1
Caelo	Melilot herb, cut	nachprüfung	1
Caelo	Melilot herb, cut	12289203	5
Caelo	Melilot herb, cut	612M-01664	1
Caelo	Melilot herb, cut	11307606	9
Caelo	Melilot herb, cut	12289201	1
Caelo	Melilot herb, cut	25101205	1

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Supplier	Substance	Batch	Spectra
Caelo	Melilot herb, cut	12289202	10
Caelo	Melilot herb, cut	12289205	3
Caelo	Melilot herb, cut	107063	1
Caelo	Melilot herb, cut	25091301	1
Caelo	Melilot herb, cut	11307601	4
Caelo	Melilot herb, cut	10335403	1
Caelo	Melilot herb, cut	10335410	1
Caelo	Melissa leaf, cut	13214720	2
Caelo	Melissa leaf, cut	12032314	8
Caelo	Melissa leaf, cut	12032310	2
Caelo	Melissa leaf, cut	12032302	1
Caelo	Melissa leaf, cut	15121705	2
Caelo	Melissa leaf, cut	1535036	1
Caelo	Melissa leaf, cut	12032307	2
Caelo	Melissa leaf, cut	15350306	1
Caelo	Melissa leaf, cut	15121708	2
Caelo	Melissa leaf, cut	14221705	1
Caelo	Melissa leaf, cut	19041303	1
Caelo	Melissa leaf, cut	2161a121009	1
Caelo	Melissa leaf, cut	13214707	1
Caelo	Melissa leaf, cut	10310912	1
Caelo	Melissa leaf, cut		3
Caelo	Melissa leaf, cut	10310919	1
Caelo	Melissa leaf, cut	CH.111111	1
Caelo	Melissa leaf, cut	25021301	1
Caelo	Melissa leaf, cut	25061303	1
Caelo	Melissa leaf, cut	10310921	1
Caelo	Melissa leaf, cut	24011407	1
Caelo	Melissa leaf, cut	12032303	3
Caelo	Melissa leaf, cut	13030805	1
Caelo	Melissa leaf, cut	13030804	1
Caelo	Melissa leaf, cut	1009	1
Caelo	Melissa leaf, cut	14221701	2
Caelo	Melissa leaf, cut	13214705	2
Caelo	Melissa leaf, cut	13030803	2
Caelo	Melissa leaf, cut	13030801	1
Caelo	Melissa leaf, cut	12032319	5
Caelo	Melissa leaf, cut	12032316	3
Caelo	Melissa leaf, cut	12032315	1
Caelo	Melissa leaf, cut	12032311	1
Caelo	Melissa leaf, cut	14111319	1
Caelo	Melissa leaf, cut	10310918	1
Caelo	Melissa leaf, cut	12032309	2
Caelo	Melissa leaf, cut	12032308	1
Caelo	Melissa leaf, cut	2161a120718	1
Caelo	Melissa leaf, cut	10310914	1
Caelo	Methadone hydrochloride	15244720	1
Caelo	Methadone hydrochloride	16135310	1
Caelo	Methadone hydrochloride	12344819	1
Caelo	Methadone hydrochloride	16135332	1
Caelo	Methadone hydrochloride	12171918	1
Caelo	Methadone hydrochloride	16F24-B02-323184	1
Caelo	Methadone hydrochloride	14C24-B01-292860	1
Caelo	Methadone hydrochloride	1327H051	1
Caelo	Methadone hydrochloride	12171914	1
Caelo	Methadone hydrochloride	13266521	2
Caelo	Methadone hydrochloride	13266518	3
Caelo	Methadone hydrochloride	13266515	1
Caelo	Methadone hydrochloride	13266514	1
Caelo	Methadone hydrochloride	13266512	2

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Supplier	Substance	Batch	Spectra
Caelo	Methadone hydrochloride	13266509	1
Caelo	Methadone hydrochloride	13266505	4
Caelo	Methadone hydrochloride	13266504	2
Caelo	Methadone hydrochloride	13266502	3
Caelo	Methadone hydrochloride	13266501	1
Caelo	Methadone hydrochloride	12344821	2
Caelo	Methadone hydrochloride	12344818	2
Caelo	Methadone hydrochloride	17239504	1
Caelo	Methadone hydrochloride	12344816	3
Caelo	Methadone hydrochloride	12344814	2
Caelo	Methadone hydrochloride	17239507	1
Caelo	Methadone hydrochloride	17I15-B02-339523	1
Caelo	Methadone hydrochloride	12171907	1
Caelo	Methadone hydrochloride	10076407	1
Caelo	Methadone hydrochloride	11227507	1
Caelo	Methadone hydrochloride	12171902	1
Caelo	Methadone hydrochloride	16135330	1
Caelo	Methadone hydrochloride	12171906	2
Caelo	Methadone hydrochloride	16135329	1
Caelo	Methadone hydrochloride	15244702	1
Caelo	Methadone hydrochloride	15244713	4
Caelo	Methadone hydrochloride	15244709	2
Caelo	Methadone hydrochloride	15244706	3
Caelo	Methadone hydrochloride	15244705	1
Caelo	Methadone hydrochloride	15244704	4
Caelo	Methadone hydrochloride	15215501	1
Caelo	Methadone hydrochloride	15I24-B07-317266	1
Caelo	Methadone hydrochloride	16135303	1
Caelo	Methadone hydrochloride	16135304	1
Caelo	Methadone hydrochloride	17011406	1
Caelo	Methadone hydrochloride	12344802	1
Caelo	Methadone hydrochloride	16135308	2
Caelo	Methadone hydrochloride	16135311	4
Caelo	Methadone hydrochloride	12344807	1
Caelo	Methadone hydrochloride	16135317	1
Caelo	Methadone hydrochloride	16135327	1
Caelo	Methadone hydrochloride	12344810	1
Caelo	Methadone hydrochloride	16135326	2
Caelo	Methadone hydrochloride	13266511	2
Caelo	Methadone hydrochloride	12344812	2
Caelo	Methadone hydrochloride	16135324	1
Caelo	Methadone hydrochloride	16135318	2
Caelo	Methylrosanilinium ch...	12H28-No6	1
Caelo	Methylrosanilinium ch...	9238106	1
Caelo	Methylrosanilinium ch...	12/17-N05	1
Caelo	Methylrosanilinium ch...	8088701	1
Caelo	Methylrosanilinium ch...	13H28-N03	19
Caelo	Methylrosanilinium ch...	13184801	1
Caelo	Methylrosanilinium ch...	9238107	2
Caelo	Methylrosanilinium ch...	12H28-N06	2
Caelo	Methylrosanilinium ch...	9238109	1
Caelo	Metoclopramide hydroc...	3414U-018969	1
Caelo	Metoclopramide hydroc...	15227001	14
Caelo	Midazolam hydrochloride	13370007	1
Caelo	Midazolam hydrochloride	15224607	1
Caelo	Midazolam hydrochloride	15224616	1
Caelo	Midazolam hydrochloride	15224614	1
Caelo	Midazolam hydrochloride	15224605	1
Caelo	Midazolam hydrochloride	15224603	1
Caelo	Midazolam hydrochloride	14339015	1

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Supplier	Substance	Batch	Spectra
Caelo	Midazolam hydrochloride	14339009	1
Caelo	Midazolam hydrochloride	14339008	2
Caelo	Midazolam hydrochloride	12094512	1
Caelo	Midazolam hydrochloride	133370003	1
Caelo	Midazolam hydrochloride	14339002	1
Caelo	Midazolam hydrochloride	1225811	3
Caelo	Midazolam hydrochloride	2061508	1
Caelo	Midazolam hydrochloride	11184705	1
Caelo	Mistletoe, cut	11021303	1
Caelo	Mistletoe, cut	11266705	6
Caelo	Mistletoe, cut	29101302	1
Caelo	Mistletoe, cut	11266708	9
Caelo	Mistletoe, cut	14292514	1
Caelo	Mistletoe, cut	11266710	7
Caelo	Mistletoe, cut	12011301	1
Caelo	Mistletoe, cut	3813E-01695	1
Caelo	Mistletoe, cut	11266703	7
Caelo	Mistletoe, cut	26071302	1
Caelo	Mistletoe, cut	14034209	1
Caelo	Mistletoe, cut	29071302	1
Caelo	Mistletoe, cut	11266702	4
Caelo	Mistletoe, cut	29081302	1
Caelo	Mistletoe, cut	11294005	16
Caelo	Mistletoe, cut	11294004	6
Caelo	Mistletoe, cut	10081205	1
Caelo	Mistletoe, cut	11266712-3450311162	1
Caelo	Mistletoe, cut	14292506	2
Caelo	Mistletoe, cut	1266711	1
Caelo	Mistletoe, cut	10273420	9
Caelo	Mistletoe, cut	18031303	1
Caelo	Mistletoe, cut	1027342010-13	1
Caelo	Mistletoe, cut	6061306	1
Caelo	Mistletoe, cut	27121305	1
Caelo	Mistletoe, cut	10273407	3
Caelo	Mistletoe, cut	24011401	1
Caelo	Mistletoe, cut	11294002	3
Caelo	Mistletoe, cut	11266714	4
Caelo	Mistletoe, cut	10273412	4
Caelo	Mistletoe, cut	10091201	1
Caelo	Mistletoe, cut	23111204	1
Caelo	Mistletoe, cut	11266712	11
Caelo	Mistletoe, cut	10273418	1
Caelo	Mistletoe, cut	11294003	3
Caelo	Mistletoe, cut	20121303	1
Caelo	Mistletoe, cut	11266709	9
Caelo	Mistletoe, cut	17061304	1
Caelo	Mistletoe, cut	28101304	1
Caelo	Mistletoe, cut	4313E-01695	1
Caelo	Mistletoe, cut	29061201	1
Caelo	Mistletoe, cut	11266713	2
Caelo	Mistletoe, cut	11266704	16
Caelo	Molecular distilled g…	11160012	1
Caelo	Morphine hydrochloride	15199705Nr.2	1
Caelo	Morphine hydrochloride	15199705Nr.3	1
Caelo	Morphine hydrochloride	12104403	1
Caelo	Morphine hydrochloride	14238619	2
Caelo	Morphine hydrochloride	16184610	1
Caelo	Morphine hydrochloride	12318101	1
Caelo	Morphine hydrochloride	14055084	1
Caelo	Morphine hydrochloride	13081310	1

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Supplier	Substance	Batch	Spectra
Caelo	Morphine hydrochloride	14238604	1
Caelo	Morphine hydrochloride	15439409	1
Caelo	Morphine hydrochloride	1543904	1
Caelo	Morphine hydrochloride	14238617	1
Caelo	Morphine hydrochloride	13125206	1
Caelo	Morphine hydrochloride	15199711	4
Caelo	Morphine hydrochloride	15199705	1
Caelo	Morphine hydrochloride	15439405	2
Caelo	Morphine hydrochloride	12104409	1
Caelo	Motherwort herb, cut	5061203	1
Caelo	Motherwort herb, cut	12376403	1
Caelo	Motherwort herb, cut	12376407	1
Caelo	Motherwort herb, cut	12231502	3
Caelo	Motherwort herb, cut	nachprüfung	1
Caelo	Motherwort herb, cut	11293004	3
Caelo	Motherwort herb, cut	12231503	2
Caelo	Motherwort herb, cut	12376402	1
Caelo	Motherwort herb, cut	12376408	2
Caelo	Motherwort herb, cut	10244610	1
Caelo	Motherwort herb, cut	2712E-01658	1
Caelo	Motherwort herb, cut	11293003	1
Caelo	Mullein flower, cut	11020902	1
Caelo	Mullein flower, cut	11020802	2
Caelo	Mullein flower, cut	521505390	1
Caelo	Mullein flower, cut	10156901	1
Caelo	Mullein flower, cut	13229702	1
Caelo	Mullein flower, cut	18031301	1
Caelo	Mullein flower, cut	13229701	2
Caelo	Mullein flower, cut	11020708	1
Caelo	Mullein flower, cut	613M-01475	1
Caelo	Mullein flower, cut	12317104	1
Caelo	Mullein flower, cut	11020713	5
Caelo	Mullein flower, cut	11020711	1
Caelo	Mullein flower, cut	12192904	1
Caelo	Mullein flower, cut	12192903	6
Caelo	Mullein flower, cut	12192901	4
Caelo	Mullein flower, cut	11233402	1
Caelo	Mullein flower, cut	12170901	1
Caelo	Mullein flower, cut	12170906	1
Caelo	Mullein flower, cut	1219203	1
Caelo	Mullein flower, cut	12170903	3
Caelo	Mullein flower, cut	12192902	1
Caelo	Mullein flower, cut	12192905	7
Caelo	Mullein flower, cut	12192907	4
Caelo	Mullein flower, cut	16081201	1
Caelo	Mullein flower, cut	11333402	1
Caelo	Mullein flower, cut	11233401	6
Caelo	Mullein flower, cut	11366403	3
Caelo	Mullein flower, cut	11366402	1
Caelo	Myrrh	Nachprüfung	1
Caelo	Myrrh	10057916	1
Caelo	Myrrh	12269901	2
Caelo	Myrrh	11276806	3
Caelo	Myrrh	11276811	2
Caelo	Myrrh	28101401	1
Caelo	Myrrh	12305709	1
Caelo	Myrrh	12244411	1
Caelo	Myrrh	15189202	1
Caelo	Myrrh	14244602	1
Caelo	Myrrh	12269913	1

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Supplier	Substance	Batch	Spectra
Caelo	Myrrh	14244602	1
Caelo	Myrrh	12269913	1
Caelo	Myrrh	11277111	1
Caelo	Myrrh	12269906	1
Caelo	Myrrh	11277111	1
Caelo	Myrrh	12244404	1
Caelo	Myrrh	12269904	5
Caelo	Myrrh	25071404	1
Caelo	Myrrh	12244406	1
Caelo	Myrrh	11277105	1
Caelo	Myrrh	11276810	1
Caelo	Myrrh	13108701	3
Caelo	Myrrh	30121413	1
Caelo	Myrrh	12269907	1
Caelo	Nettle leaf, cut	nachprüfung	1
Caelo	Nettle leaf, cut	12183908-3391311070	1
Caelo	Nettle leaf, cut	83374109	1
Caelo	Nettle leaf, cut	intch:313011	1
Caelo	Nettle leaf, cut	12183908-3405310181	1
Caelo	Nettle leaf, cut	12183908-3443311112	1
Caelo	Nettle leaf, cut	3021401	1
Caelo	Nettle leaf, cut	72085497	1
Caelo	Nettle leaf, cut	83142389	1
Caelo	Nettle leaf, cut	12183914	12
Caelo	Nettle leaf, cut	12184001	6
Caelo	Nettle leaf, cut	12184004	10
Caelo	Nettle leaf, cut	12184005	8
Caelo	Nettle leaf, cut	12184502	2
Caelo	Nettle leaf, cut	12184503	3
Caelo	Nettle leaf, cut	1218707	1
Caelo	Nettle leaf, cut	12195101	4
Caelo	Nettle leaf, cut	12354001	1
Caelo	Nettle leaf, cut	12183910	12
Caelo	Nettle leaf, cut	12814001	1
Caelo	Nettle leaf, cut	12195001	1
Caelo	Nettle leaf, cut	13091302	1
Caelo	Nettle leaf, cut	13386801	6
Caelo	Nettle leaf, cut	14344903	1
Caelo	Nettle leaf, cut	14344907	4
Caelo	Nettle leaf, cut	15063105	1
Caelo	Nettle leaf, cut	17121205	1
Caelo	Nettle leaf, cut	18071202	1
Caelo	Nettle leaf, cut	19091205	1
Caelo	Nettle leaf, cut	20111306	1
Caelo	Nettle leaf, cut	1283910	1
Caelo	Nettle leaf, cut	12183909	1
Caelo	Nettle leaf, cut	12183911	16
Caelo	Nettle leaf, cut	120375901	1
Caelo	Nettle leaf, cut		3
Caelo	Nettle leaf, cut	33/AD1	1
Caelo	Nettle leaf, cut	10162712	1
Caelo	Nettle leaf, cut	10282806	1
Caelo	Nettle leaf, cut	10282807	2
Caelo	Nettle leaf, cut	10291409	1
Caelo	Nettle leaf, cut	10291413	2
Caelo	Nettle leaf, cut	12183908	6
Caelo	Nettle leaf, cut	29071303	1
Caelo	Nettle leaf, cut	2051302	1
Caelo	Nettle leaf, cut	10291414	5
Caelo	Nettle leaf, cut	613A-03054	1

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Supplier	Substance	Batch	Spectra
Caelo	Nettle leaf, cut	12034414	1
Caelo	Nettle leaf, cut	12034403	9
Caelo	Nettle leaf, cut	10291422	4
Caelo	Nettle leaf, cut	10291411	3
Caelo	Nettle leaf, cut	12034402	4
Caelo	Nettle leaf, cut	7031302	1
Caelo	Nettle leaf, cut	10291410	2
Caelo	Nettle leaf, cut	12184706	5
Caelo	Nettle root, cut	11254903	5
Caelo	Nettle root, cut	10081202	1
Caelo	Nettle root, cut	11254902	5
Caelo	Nettle root, cut	11254904	3
Caelo	Nettle root, cut	11265002	6
Caelo	Nettle root, cut	11265003	2
Caelo	Nettle root, cut	11265006	1
Caelo	Nettle root, cut	6631B130610	1
Caelo	Nettle root, cut	10250203	1
Caelo	Nettle root, cut	6441A121024	1
Caelo	Nettle seed	20111301	1
Caelo	Nettle seed	13010607	1
Caelo	Nettle seed	13010612	2
Caelo	Nettle seed	12131505	1
Caelo	Nettle seed	13387109	1
Caelo	Nettle seed	15290602	1
Caelo	Nettle seed	16327001	1
Caelo	Nutmeg	12376805	1
Caelo	Nutmeg	12376802	2
Caelo	Nutmeg, powdered (spi…	12102306	1
Caelo	Nutmeg, powdered (spi…	12102305	2
Caelo	Nystatin	12158020	1
Caelo	Nystatin	12158021	7
Caelo	Nystatin	121580921	1
Caelo	Nystatin	12158oo4	1
Caelo	Nystatin	13101201	1
Caelo	Nystatin	12158019	5
Caelo	Nystatin	6082013B	1
Caelo	Nystatin	13173410	1
Caelo	Nystatin	13173401	18
Caelo	Nystatin	12158009	1
Caelo	Nystatin	14363514	1
Caelo	Nystatin	15335310	1
Caelo	Nystatin	11069724	1
Caelo	Nystatin	15335313	1
Caelo	Nystatin	C129330	1
Caelo	Nystatin	12158006	8
Caelo	Nystatin	13101202	1
Caelo	Nystatin	12158004	4
Caelo	Nystatin	11069706	2
Caelo	Nystatin	11069704	1
Caelo	Nystatin	11069716	1
Caelo	Nystatin	12158005	1
Caelo	Nystatin	11069719	1
Caelo	Nystatin	3101201	1
Caelo	Nystatin	1/0913	2
Caelo	Nystatin	11069730	1
Caelo	Nystatin	2091304	1
Caelo	Nystatin	12138021	2
Caelo	Nystatin	12017003	1
Caelo	Nystatin	120700902	1
Caelo	Nystatin	12017004	5

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Supplier	Substance	Batch	Spectra
Caelo	Nystatin	12017015	2
Caelo	Nystatin	12017009	1
Caelo	Nystatin	12017010	2
Caelo	Nystatin	11069731	1
Caelo	Nystatin	12017011	3
Caelo	Oak bark, cut	15314904	1
Caelo	Oak bark, cut	15146102	1
Caelo	Oak bark, cut	15146103	1
Caelo	Oak bark, cut	15146104	1
Caelo	Oak bark, cut	15146105	2
Caelo	Oak bark, cut	15146105	5
Caelo	Oak bark, cut	15314901	1
Caelo	Oak bark, cut	15314903	1
Caelo	Oak bark, cut	15146104	3
Caelo	Oak bark, cut	15146109	2
Caelo	Oak bark, cut	14277004	2
Caelo	Oak bark, cut	15146101	2
Caelo	Oak bark, cut	14277004	1
Caelo	Oak bark, cut	14277004	1
Caelo	Oak bark, cut	13360312	5
Caelo	Oak bark, cut	13360311	2
Caelo	Oak bark, cut	13360309	2
Caelo	Oak bark, cut	13360308	1
Caelo	Oak bark, cut	13360306	2
Caelo	Oak bark, cut	13360304	1
Caelo	Oak bark, cut	13360302	6
Caelo	Oak bark, cut	123test	1
Caelo	Oak bark, cut	15146101	1
Caelo	Oak bark, cut	15314905	2
Caelo	Oak bark, cut	15146102	1
Caelo	Oak bark, cut	3041301	1
Caelo	Oak bark, cut	nachprüfung	1
Caelo	Oak bark, cut	41109-4-P	1
Caelo	Oak bark, cut	26081302	1
Caelo	Oak bark, cut	26061206	1
Caelo	Oak bark, cut	2413M-01303	1
Caelo	Oak bark, cut	22081204	1
Caelo	Oak bark, cut	19032013	2
Caelo	Oak bark, cut	17101208	1
Caelo	Oak bark, cut	161212	1
Caelo	Oak bark, cut	16081305	1
Caelo	Oak bark, cut	15146110	1
Caelo	Oak bark, cut	14111316	1
Caelo	Oak bark, cut	13360301	1
Caelo	Oak bark, cut	12221105	2
Caelo	Oak bark, cut	12221104	3
Caelo	Oak bark, cut	12221102	1
Caelo	Oak bark, cut	12221101	13
Caelo	Oak bark, cut	1135121o	1
Caelo	Oak bark, cut	11351205	4
Caelo	Oak bark, cut	11351203	2
Caelo	Oak bark, cut	11351202	5
Caelo	Oak bark, cut	10348615	2
Caelo	Oak bark, cut	10348613	2
Caelo	Oak bark, cut	10348612	3
Caelo	Oak bark, cut	10348606	1
Caelo	Oak bark, cut	7021302	1
Caelo	Oak bark, cut	5091302	1
Caelo	Oak bark, cut	280814A	1
Caelo	Oak bark, cut	13360306	1

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Supplier	Substance	Batch	Spectra
Caelo	Oak bark, cut	11351208	3
Caelo	Oak bark, cut	10061504	1
Caelo	Oak bark, cut	11351210	10
Caelo	Oak bark, cut	13360305	1
Caelo	Oak bark, cut	11351201	3
Caelo	Oak bark, cut	11351207	13
Caelo	Oak bark, cut	11351207-3384310110	1
Caelo	Oak bark, cut	11351209	11
Caelo	Oak bark, cut	11351206	15
Caelo	Oak bark, cut	10348605	1
Caelo	Oak bark, cut	1081401	1
Caelo	Oak bark, powdered	10261513	1
Caelo	Oat straw, cut	11280015	3
Caelo	Oat straw, cut	11280019	1
Caelo	Oat straw, cut	11280017	2
Caelo	Oat straw, cut	11280011	1
Caelo	Oat straw, cut	11280014	1
Caelo	Oat straw, cut	11280012	2
Caelo	Oat straw, cut	11280008	3
Caelo	Oat straw, cut	11280006	2
Caelo	Oat straw, cut	11280010	1
Caelo	Olive leaf	12159803	1
Caelo	Olive leaf	12159805	1
Caelo	Oregano herb	12360902	2
Caelo	Oregano herb	12360904	1
Caelo	Oregano herb	12360901	6
Caelo	Oregano herb	11340709	1
Caelo	Oregano herb	11340708	1
Caelo	Oregano herb	11340705	2
Caelo	Oregano herb	11340703	2
Caelo	Orris root	13113402	1
Caelo	Orris root	13113401	2
Caelo	Orris root	1026706	1
Caelo	Orris root	11026701	2
Caelo	Orris root	nachprüfung	2
Caelo	Orris root	13113404	1
Caelo	Orris root	11026704	5
Caelo	Orris root	11026706	1
Caelo	Parsley herb, rubbed	12376602	3
Caelo	Parsley herb, rubbed	12376601	2
Caelo	Parsley herb, rubbed	12376603	2
Caelo	Parsley herb, rubbed	51978126	1
Caelo	Parsley root, cut	13156003	1
Caelo	Parsley root, cut	13029403	1
Caelo	Parsley root, cut	nachprüfung	1
Caelo	Parsley root, cut	11038704	1
Caelo	Parsley root, cut	11172101	1
Caelo	Parsley root, cut	11172103	1
Caelo	Parsley root, cut	12080302	1
Caelo	Parsley root, cut	12080304	1
Caelo	Parsley root, cut	12080309	1
Caelo	Parsley root, cut	12080311	2
Caelo	Parsley root, cut	13156005	1
Caelo	Passionflower herb, cut	12031714	3
Caelo	Passionflower herb, cut	11049115	1
Caelo	Passionflower herb, cut	11049114	1
Caelo	Passionflower herb, cut	11049113	1
Caelo	Passionflower herb, cut	1011A-01669	1
Caelo	Passionflower herb, cut	11049108	2
Caelo	Passionflower herb, cut	110049112	1

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Supplier	Substance	Batch	Spectra
Caelo	Passionflower herb, cut	13141205	5
Caelo	Passionflower herb, cut	11049111	1
Caelo	Passionflower herb, cut	12031717	7
Caelo	Passionflower herb, cut	12101301	1
Caelo	Passionflower herb, cut	12031702	2
Caelo	Passionflower herb, cut	2913A-01669	1
Caelo	Passionflower herb, cut	15085105	1
Caelo	Passionflower herb, cut	12031710	16
Caelo	Passionflower herb, cut	13141203	2
Caelo	Passionflower herb, cut	13141202	7
Caelo	Passionflower herb, cut	13141201	1
Caelo	Passionflower herb, cut	12031716	3
Caelo	Passionflower herb, cut	11049116	4
Caelo	Passionflower herb, cut	12031715	8
Caelo	Passionflower herb, cut	12031713	1
Caelo	Passionflower herb, cut	12031712	1
Caelo	Passionflower herb, cut	12031707	1
Caelo	Passionflower herb, cut	12031705	5
Caelo	Passionflower herb, cut	12031704	1
Caelo	Passionflower herb, cut	12031703	2
Caelo	Peppermint leaf, cut	13030808-3401310161	1
Caelo	Peppermint leaf, cut	12266908-343431160	1
Caelo	Peppermint leaf, cut	313A-01503	1
Caelo	Peppermint leaf, cut	4912E-01503	1
Caelo	Peppermint leaf, cut	12032319	2
Caelo	Peppermint leaf, cut	ChB:311092	1
Caelo	Peppermint leaf, cut	14221701	1
Caelo	Peppermint leaf, cut	13214720	1
Caelo	Peppermint leaf, cut	13214707	2
Caelo	Peppermint leaf, cut	13214706	1
Caelo	Peppermint leaf, cut	13214705	1
Caelo	Peppermint leaf, cut	12032311	1
Caelo	Peppermint leaf, cut	13105001	1
Caelo	Peppermint leaf, cut	13030808	1
Caelo	Peppermint leaf, cut	13030807	4
Caelo	Peppermint leaf, cut	13030806	1
Caelo	Peppermint leaf, cut	13030805	6
Caelo	Peppermint leaf, cut	13030804	1
Caelo	Peppermint leaf, cut	12266913	10
Caelo	Peppermint leaf, cut	13030809	2
Caelo	Peppermint leaf, cut	268320	1
Caelo	Peppermint leaf, cut	12266912	1
Caelo	Peppermint leaf, cut	Nachprüfung	1
Caelo	Peppermint leaf, cut	2181B090928	1
Caelo	Peppermint leaf, cut	2181A1209-13	1
Caelo	Peppermint leaf, cut	12266908	9
Caelo	Peppermint leaf, cut	161212	1
Caelo	Peppermint leaf, cut	14339202	2
Caelo	Peppermint leaf, cut	14083102	3
Caelo	Peppermint leaf, cut	12266911	1
Caelo	Peppermint leaf, cut	5091307	1
Caelo	Peppermint leaf, cut	6011403	1
Caelo	Peppermint leaf, cut	8101301	1
Caelo	Peppermint leaf, cut	20061202	1
Caelo	Peppermint leaf, cut	912E-01505	1
Caelo	Peppermint leaf, cut	11294405	1
Caelo	Peppermint leaf, cut	11294409	2
Caelo	Peppermint leaf, cut	11327801	2
Caelo	Peppermint leaf, cut	11327802	1
Caelo	Peppermint leaf, cut	11327803	8

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Supplier	Substance	Batch	Spectra
Caelo	Peppermint leaf, cut	11327808	5
Caelo	Peppermint leaf, cut	1132803	1
Caelo	Peppermint leaf, cut	11347609	1
Caelo	Peppermint leaf, cut	12054149	1
Caelo	Peppermint leaf, cut	12266903	7
Caelo	Peppermint leaf, cut	11294401	3
Caelo	Peppermint leaf, cut	2181B140205	1
Caelo	Peppermint leaf, cut	20111215	1
Caelo	Peppermint leaf, cut	12266904	3
Caelo	Peppermint leaf, cut	Int.Ch.:313011	1
Caelo	Peppermint leaf, cut	276514	4
Caelo	Phenobarbital	12D30-N02	1
Caelo	Phenol	13296902	1
Caelo	Phenol	12223022	1
Caelo	Phenol	12223020	1
Caelo	Phenol	12223014	1
Caelo	Phenol	12223005	1
Caelo	Phenol	7061305	1
Caelo	Phenol	11163801	1
Caelo	Phenol	12223001	2
Caelo	Phenol	11163809	1
Caelo	Phenol	11163802	1
Caelo	Piper cubeba	11081903	1
Caelo	Podophyllum resin (fr…	12287810	1
Caelo	Podophyllum resin (fr…	12287805	1
Caelo	Podophyllum resin (fr…	11085807	6
Caelo	Podophyllum resin (fr…	11085803	1
Caelo	Podophyllum resin (fr…	82433349	1
Caelo	Podophyllum resin (fr…	12379903	1
Caelo	Podophyllum resin (fr…	11085811	1
Caelo	Potassium hydrocarbon…	12141920	1
Caelo	Potassium hydrocarbon…	10052622	1
Caelo	Potassium hydrocarbon…	12141919	3
Caelo	Potassium hydrocarbon…	11105801	1
Caelo	Potassium hydrocarbon…	13390303	1
Caelo	Potassium hydrocarbon…	10052610	2
Caelo	Potassium hydrocarbon…	11105804	2
Caelo	Potassium hydrocarbon…	11105808	1
Caelo	Potassium hydrocarbon…	13141926	1
Caelo	Potassium hydrocarbon…	8101202	1
Caelo	Potassium hydrocarbon…	11105822	1
Caelo	Potassium hydrocarbon…	12141924	3
Caelo	Potassium hydrocarbon…	1214190	1
Caelo	Potassium hydrocarbon…	12141905	3
Caelo	Potassium hydrocarbon…	6011405	1
Caelo	Potassium hydrocarbon…	12239705	1
Caelo	Potassium hydrocarbon…	12239703	8
Caelo	Potassium hydrocarbon…	12239702	2
Caelo	Potassium hydrocarbon…	12230703	1
Caelo	Potassium hydrocarbon…	12141912	3
Caelo	Potassium hydrocarbon…	10052629	1
Caelo	Potassium hydrocarbon…	1214924	1
Caelo	Potassium hydrocarbon…	12141930	2
Caelo	Potassium hydrocarbon…	11105818	2
Caelo	Potassium hydrocarbon…	12141910	14
Caelo	Potassium hydrocarbon…	1011M-01728	1
Caelo	Potassium hydrocarbon…	24051301	1
Caelo	Potassium hydrocarbon…	IntCh:217002	1
Caelo	Potassium hydrocarbon…	3812Q-01728	1
Caelo	Potassium hydrocarbon…	33131-01728	1

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Supplier	Substance	Batch	Spectra
Caelo	Potassium hydrocarbon…	13390307	1
Caelo	Potassium hydrocarbon…	700544	1
Caelo	Potassium hydrocarbon…	20080410-3	1
Caelo	Potassium hydrocarbon…	11105812	2
Caelo	Potassium hydrocarbon…	12239701	5
Caelo	Potassium hydroxide	12382601	2
Caelo	Potassium hydroxide	12382606	2
Caelo	Potassium hydroxide	12382611	2
Caelo	Potassium hydroxide	13275201	1
Caelo	Potassium hydroxide	12057905	2
Caelo	Potassium hydroxide	12382603	6
Caelo	Potassium hydroxide	12057912	2
Caelo	Potassium hydroxide	12057908	2
Caelo	Potassium hydroxide	12057903	1
Caelo	Potassium hydroxide	27111310	1
Caelo	Potassium hydroxide	12057906	1
Caelo	Potassium hydroxide	11165705	1
Caelo	Potassium hydroxide	17091202	1
Caelo	Potassium hydroxide	13275207	1
Caelo	Primrose flower	11206807	1
Caelo	Primrose flower	11374403	1
Caelo	Primrose flower	11206811	4
Caelo	Primrose flower	11206810	7
Caelo	Primrose flower	11206811	1
Caelo	Primrose flower	11206808	2
Caelo	Primrose flower	5021303	1
Caelo	Primrose flower	11206603	1
Caelo	Primrose flower	11206804	1
Caelo	Primrose flower	10072509	1
Caelo	Primrose flower	9021301	1
Caelo	Primrose flower	10207104	1
Caelo	Primrose flower	13086605	1
Caelo	Primrose flower	11374402	1
Caelo	Primrose flower	11268005	2
Caelo	Primrose flower	11206803	5
Caelo	Primrose flower	13086608	1
Caelo	Primrose flower	11206805	1
Caelo	Primrose flower	11374404	1
Caelo	Primrose flower	11374401	12
Caelo	Primrose flower	13086602	2
Caelo	Primrose flower	113744044	1
Caelo	Primrose flower	25091306	1
Caelo	Primrose flower	13086603	5
Caelo	Primrose flower	13276904	1
Caelo	Primrose flower	13086603	2
Caelo	Primrose flower	1308660	1
Caelo	Primrose root, cut	4021410	1
Caelo	Primrose root, cut	10382010	1
Caelo	Primrose root, cut	5010E-02159	1
Caelo	Primrose root, cut	24011301	1
Caelo	Primrose root, cut	71653517	1
Caelo	Primrose root, cut	13087005	3
Caelo	Primrose root, cut	13087004	1
Caelo	Primrose root, cut	Int.Ch:318090	1
Caelo	Primrose root, cut	13087002	7
Caelo	Primrose root, cut	13067001	1
Caelo	Primrose root, cut	12064506	4
Caelo	Primrose root, cut	13087005-3534411072	1
Caelo	Primrose root, cut	12064503	1
Caelo	Primrose root, cut	12064502	1

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Supplier	Substance	Batch	Spectra
Caelo	Primrose root, cut	10382013	2
Caelo	Primrose root, cut	212Q-02159	1
Caelo	Primrose root, cut	10382012	1
Caelo	Primrose root, cut	13087001	1
Caelo	Primrose root, cut	10382009	2
Caelo	Propolis extract (96%…	11124101	1
Caelo	Psyllium seed	15190306	2
Caelo	Psyllium seed	15190304	3
Caelo	Psyllium seed	15190303	4
Caelo	Psyllium seed	15249313	2
Caelo	Psyllium seed	7380a120911	1
Caelo	Psyllium seed	12185502	1
Caelo	Psyllium seed	15190302	3
Caelo	Psyllium seed	12185503	3
Caelo	Psyllium seed	13305903	1
Caelo	Psyllium seed	12185504	11
Caelo	Psyllium seed	12185508	3
Caelo	Psyllium seed	12185509	6
Caelo	Psyllium seed	11185803	1
Caelo	Psyllium seed	12276510	1
Caelo	Psyllium seed	13234309	1
Caelo	Psyllium seed	13234310	3
Caelo	Psyllium seed	13305911	1
Caelo	Psyllium seed	13305904	2
Caelo	Psyllium seed	13305906	2
Caelo	Psyllium seed	13305907	5
Caelo	Psyllium seed	10291206	1
Caelo	Psyllium seed	10291205	1
Caelo	Psyllium seed	10291204	1
Caelo	Psyllium seed	10291207	7
Caelo	Psyllium seed	13305910	4
Caelo	Psyllium seed	9336709	1
Caelo	Psyllium seed	13305908	3
Caelo	Psyllium seed	11185811	4
Caelo	Psyllium seed	10061503	1
Caelo	Psyllium seed	12140301	7
Caelo	Pumpkin seed, peeled	140736306	1
Caelo	Pumpkin seed, peeled	16081206	2
Caelo	Pumpkin seed, peeled	16081202	1
Caelo	Pumpkin seed, peeled	14186910	1
Caelo	Pumpkin seed, peeled	14186905	1
Caelo	Pumpkin seed, peeled	122490911	1
Caelo	Pumpkin seed, peeled	14073603	1
Caelo	Pumpkin seed, peeled	12249011	2
Caelo	Pumpkin seed, peeled	12249001	2
Caelo	Ramsons herb, cut	12380801	2
Caelo	Ramsons herb, cut	11182205	1
Caelo	Ramsons herb, cut	11182204	1
Caelo	Ramsons herb, cut	11182203	1
Caelo	Ramsons herb, cut	3511B111005	2
Caelo	Ramsons herb, cut	12380803	2
Caelo	Ramsons herb, cut	14343305	1
Caelo	Ramsons herb, cut	12380802	2
Caelo	Raspberry leaf, cut	12392709	1
Caelo	Raspberry leaf, cut	231013c	1
Caelo	Raspberry leaf, cut	IntCh:311090	1
Caelo	Raspberry leaf, cut	10013407	1
Caelo	Raspberry leaf, cut	10013406	4
Caelo	Raspberry leaf, cut	314U1511	1
Caelo	Raspberry leaf, cut	713E-01511	1

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Supplier	Substance	Batch	Spectra
Caelo	Raspberry leaf, cut	1236705	1
Caelo	Raspberry leaf, cut	7011402	1
Caelo	Raspberry leaf, cut	12362709	5
Caelo	Raspberry leaf, cut	12362707	6
Caelo	Raspberry leaf, cut	12362703	10
Caelo	Raspberry leaf, cut	12362701	7
Caelo	Raspberry leaf, cut	6859427	1
Caelo	Raspberry leaf, cut	2405211511	1
Caelo	Raspberry leaf, cut	10013409	2
Caelo	Raspberry leaf, cut	613M-01511	1
Caelo	Raspberry leaf, cut	12368706	1
Caelo	Raspberry leaf, cut	23051204	1
Caelo	Raspberry leaf, cut	13086704	1
Caelo	Raspberry leaf, cut	9011404	1
Caelo	Raspberry leaf, cut	8031307	1
Caelo	Raspberry leaf, cut	12103102	2
Caelo	Raspberry leaf, cut	12103108	10
Caelo	Raspberry leaf, cut	30011408	1
Caelo	Raspberry leaf, cut	2909211511	1
Caelo	Raspberry leaf, cut	25091201	1
Caelo	Raspberry leaf, cut	22081201	1
Caelo	Raspberry leaf, cut	21051302	1
Caelo	Raspberry leaf, cut	20081311	1
Caelo	Raspberry leaf, cut	18101203	1
Caelo	Raspberry leaf, cut	18041304	1
Caelo	Raspberry leaf, cut	17121203	1
Caelo	Raspberry leaf, cut	12103105	18
Caelo	Raspberry leaf, cut	12362711	10
Caelo	Raspberry leaf, cut	14018803	1
Caelo	Raspberry leaf, cut	11030705	1
Caelo	Raspberry leaf, cut	13086706	1
Caelo	Raspberry leaf, cut	12362710-3432311160	1
Caelo	Raspberry leaf, cut	12103109	2
Caelo	Raspberry leaf, cut	1210315	1
Caelo	Raspberry leaf, cut	12130107	1
Caelo	Raspberry leaf, cut	13101602-347312141	1
Caelo	Raspberry leaf, cut	13101605	1
Caelo	Raspberry leaf, cut	10136404	1
Caelo	Raspberry leaf, cut	10136412	1
Caelo	Raspberry leaf, cut	4071202	1
Caelo	Raspberry leaf, cut	11030706	4
Caelo	Raspberry leaf, cut	12362704	6
Caelo	Raspberry leaf, cut	12362705	10
Caelo	Raspberry leaf, cut	12362706	34
Caelo	Raspberry leaf, cut	12362708	3
Caelo	Raspberry leaf, cut	12362710	15
Caelo	Raspberry leaf, cut	13038002	1
Caelo	Raspberry leaf, cut	13038003	3
Caelo	Raspberry leaf, cut	307211511	1
Caelo	Raspberry leaf, cut	12362702	8
Caelo	Raspberry leaf, cut	11121201	1
Caelo	Raspberry leaf, cut	13101603	6
Caelo	Raspberry leaf, cut	13101803	1
Caelo	Raspberry leaf, cut	1310603	1
Caelo	Raspberry leaf, cut	13127901	3
Caelo	Raspberry leaf, cut	261490	1
Caelo	Raspberry leaf, cut	10013410	1
Caelo	Raspberry leaf, cut	9101204	1
Caelo	Raspberry leaf, cut	9081205	1
Caelo	Raspberry leaf, cut	11071301	1

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Supplier	Substance	Batch	Spectra
Caelo	Raspberry leaf, cut	11030704	2
Caelo	Raspberry leaf, cut	12103111	21
Caelo	Raspberry leaf, cut	11030707	3
Caelo	Raspberry leaf, cut	12103107	12
Caelo	Red poppy petals, cut	12330205	1
Caelo	Red-rose petal	12380004	1
Caelo	Red-rose petal	12380008	2
Caelo	Red-rose petal	13126304	1
Caelo	Red-rose petal, cut	12380004	2
Caelo	Red-rose petal, cut	12380007-3357319071	1
Caelo	Red-rose petal, cut	13194402	1
Caelo	Red-rose petal, cut	11304906	3
Caelo	Red-rose petal, cut	12380008	1
Caelo	Red-rose petal, cut	1319002	1
Caelo	Red-rose petal, cut	10113211	1
Caelo	Red-rose petal, cut	13194403	4
Caelo	Red-rose petal, cut	11304901	3
Caelo	Red-rose petal, cut	11304904	5
Caelo	Red-rose petal, cut	11304908	1
Caelo	Red-rose petal, cut	11304910	1
Caelo	Red-rose petal, cut	11304912	2
Caelo	Red-rose petal, cut	12380001	5
Caelo	Red-rose petal, cut	11011301	1
Caelo	Red-rose petal, cut	10306514	1
Caelo	Redwood	12049608	2
Caelo	Redwood	13106901	1
Caelo	Redwood	12041403	1
Caelo	Redwood	12049607	2
Caelo	Restharrow root, cut	6101201	1
Caelo	Restharrow root, cut	1233001	1
Caelo	Restharrow root, cut	1230004	1
Caelo	Restharrow root, cut	12330001	13
Caelo	Restharrow root, cut	12330002	1
Caelo	Restharrow root, cut	12330003	2
Caelo	Restharrow root, cut	12330005	5
Caelo	Restharrow root, cut	15101313	1
Caelo	Restharrow root, cut	11247302	2
Caelo	Restharrow root, cut	20111213	1
Caelo	Restharrow root, cut	21011306	1
Caelo	Restharrow root, cut	71035467	1
Caelo	Restharrow root, cut	72439069	1
Caelo	Restharrow root, cut	Int.Ch:212150	1
Caelo	Restharrow root, cut	4021406	1
Caelo	Restharrow root, cut	11103105	2
Caelo	Restharrow root, cut	11103107	2
Caelo	Rhubarb, cut	4612A-02187	1
Caelo	Rhubarb, cut	25111305	1
Caelo	Rhubarb, cut	15101301	1
Caelo	Rhubarb, cut	11057812	1
Caelo	Rhubarb, cut	1811a-02187	1
Caelo	Rhubarb, cut	11057811	1
Caelo	Rhubarb, cut	11265902	1
Caelo	Rhubarb, cut	13235205	1
Caelo	Rhubarb, cut	10071302	1
Caelo	Rhubarb, cut	11057804	1
Caelo	Rhubarb, cut	11057809	1
Caelo	Rhubarb, cut	11057810	2
Caelo	Rhubarb, cut	11057815	1
Caelo	Rhubarb, cut	11057818	3
Caelo	Rhubarb, cut	14155404	1

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Supplier	Substance	Batch	Spectra
Caelo	Rhubarb, cut	12211901	1
Caelo	Rhubarb, cut	11321806	1
Caelo	Rhubarb, cut	12211903	4
Caelo	Rhubarb, cut	12211904	2
Caelo	Rhubarb, cut	12211906	1
Caelo	Rhubarb, cut	12211908	2
Caelo	Rhubarb, cut	12211910	1
Caelo	Rhubarb, cut	13235201	2
Caelo	Rhubarb, cut	13235203	2
Caelo	Rhubarb, cut	12211902	5
Caelo	Rhubarb, powdered	13193106	2
Caelo	Rhubarb, powdered	13193109	1
Caelo	Rhubarb, powdered	11043825	2
Caelo	Rhubarb, powdered	11043818	1
Caelo	Rhubarb, powdered	23061402	1
Caelo	Rhubarb, powdered	11043817	1
Caelo	Rhubarb, powdered	11043826	1
Caelo	Rhubarb, powdered	11043818	1
Caelo	Rhubarb, powdered	13193104	4
Caelo	Rhubarb, powdered	11043816	2
Caelo	Rhubarb, powdered	11043816	1
Caelo	Rhubarb, powdered	11043809	1
Caelo	Rhubarb, powdered	9071201	1
Caelo	Rhubarb, powdered	11043819	2
Caelo	Rhubarb, powdered	11043822	1
Caelo	Ribwort plantain, cut	15096307	1
Caelo	Ribwort plantain, cut	15096301	1
Caelo	Ribwort plantain, cut	4021411	1
Caelo	Ribwort plantain, cut	14199202	1
Caelo	Ribwort plantain, cut	1021309	1
Caelo	Ribwort plantain, cut	1362903	1
Caelo	Ribwort plantain, cut	13410612	1
Caelo	Ribwort plantain, cut	6111209	1
Caelo	Ribwort plantain, cut	12362901	2
Caelo	Ribwort plantain, cut	13410611	1
Caelo	Ribwort plantain, cut	10315714	3
Caelo	Ribwort plantain, cut	12225802	7
Caelo	Ribwort plantain, cut	20111304	1
Caelo	Ribwort plantain, cut	15096308	1
Caelo	Ribwort plantain, cut	31051316	1
Caelo	Ribwort plantain, cut	2031302	1
Caelo	Ribwort plantain, cut	12362903	42
Caelo	Ribwort plantain, cut	12362903-3388311070	1
Caelo	Ribwort plantain, cut	13113001	8
Caelo	Ribwort plantain, cut	13113004	18
Caelo	Ribwort plantain, cut	13113005	5
Caelo	Ribwort plantain, cut	13113004-3488312172	1
Caelo	Ribwort plantain, cut	25091305	1
Caelo	Ribwort plantain, cut	25041301	1
Caelo	Ribwort plantain, cut	25021303	1
Caelo	Ribwort plantain, cut	23121304	1
Caelo	Ribwort plantain, cut	10328702	2
Caelo	Ribwort plantain, cut	13232401	1
Caelo	Ribwort plantain, cut	1313007	1
Caelo	Ribwort plantain, cut	13410601	1
Caelo	Ribwort plantain, cut	28061301	1
Caelo	Ribwort plantain, cut	19121202	1
Caelo	Ribwort plantain, cut	13113006	5
Caelo	Ribwort plantain, cut	13113007	9
Caelo	Ribwort plantain, cut	13113008	5

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Supplier	Substance	Batch	Spectra
Caelo	Ribwort plantain, cut	10315711	5
Caelo	Ribwort plantain, cut	12362902	7
Caelo	Ribwort plantain, cut	16101304	1
Caelo	Ribwort plantain, cut	12225803	4
Caelo	Ribwort plantain, cut	22021302	1
Caelo	Ribwort plantain, cut	15321102	1
Caelo	Ribwort plantain, cut	15111302	1
Caelo	Ribwort plantain, cut	15101204	1
Caelo	Ribwort plantain, cut	12362906	9
Caelo	Ribwort plantain, cut	12225801	1
Caelo	Ribwort plantain, cut	20111208	1
Caelo	Ribwort plantain, cut	13113010	4
Caelo	Ribwort plantain, cut	10315705	2
Caelo	Ribwort plantain, cut	1213E-03556	1
Caelo	Ribwort plantain, cut	13410603	4
Caelo	Ribwort plantain, cut	17071201	1
Caelo	Ribwort plantain, cut	4271A100615G	1
Caelo	Ribwort plantain, cut	10011402	1
Caelo	Ribwort plantain, cut	11061304	1
Caelo	Ribwort plantain, cut	8061208	1
Caelo	Ribwort plantain, cut	10315715	9
Caelo	Ribwort plantain, cut	12225804	1
Caelo	Robert herb, cut	11147807	5
Caelo	Robert herb, cut	11147810	4
Caelo	Robert herb, cut	8121203	1
Caelo	Robert herb, cut	12319304	2
Caelo	Robert herb, cut	11147804	1
Caelo	Robert herb, cut	12319302	2
Caelo	Robert herb, cut	12319301	1
Caelo	Robert herb, cut	11147812	3
Caelo	Robert herb, cut	12319305	1
Caelo	Rose hips peel, cut	25061203	1
Caelo	Rose hips peel, cut	12357504	2
Caelo	Rose hips peel, cut	11301407	12
Caelo	Rose hips peel, cut	9121301	1
Caelo	Rose hips peel, cut	10101206	1
Caelo	Rose hips peel, cut	11301401	2
Caelo	Rose hips peel, cut	11301403	3
Caelo	Rose hips peel, cut	11301404	1
Caelo	Rose hips peel, cut	11301405	2
Caelo	Rose hips peel, cut	15061210	1
Caelo	Rose hips peel, cut	10157312	2
Caelo	Rose hips peel, cut	10157309	1
Caelo	Rose hips peel, cut	12357502	4
Caelo	Rose hips peel, cut	7031305	1
Caelo	Rose hips peel, cut	12357505	11
Caelo	Rose hips peel, cut	12288301	1
Caelo	Rose hips peel, cut	12357501	1
Caelo	Rose hips peel, cut	13317801	2
Caelo	Rose hips peel, cut	13317805	1
Caelo	Rose hips peel, cut	14050704	1
Caelo	Rose hips peel, cut	14050705	1
Caelo	Rose hips peel, cut	2851A120904konv.	1
Caelo	Rose hips peel, cut	29131-01543	1
Caelo	Rose hips peel, cut	12288302	7
Caelo	Rose hips peel, cut	1021305	1
Caelo	Rose hips peel, cut	12064207	1
Caelo	Rose hips peel, cut	5091301	1
Caelo	Rose hips with peel, ...	114Q-01542	1
Caelo	Rose hips with peel, ...	13048701	2

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Supplier	Substance	Batch	Spectra
Caelo	Rose hips with peel, …	12064212	2
Caelo	Rose hips with peel, …	12029004	1
Caelo	Rose hips with peel, …	12029008	1
Caelo	Rose hips with peel, …	12064206	1
Caelo	Rose hips with peel, …	12064202	2
Caelo	Rose hips with peel, …	12064213	1
Caelo	Rose hips with peel, …	12064212	4
Caelo	Rose hips with peel, …	12064210	3
Caelo	Rose hips with peel, …	12064209	4
Caelo	Rose hips with peel, …	12064206	1
Caelo	Rose hips with peel, …	12064202	2
Caelo	Rose hips with peel, …	12064201	1
Caelo	Rose hips with peel, …	307211542	1
Caelo	Rose hips with peel, …	13048704	3
Caelo	Rose hips with peel, …	16111201	1
Caelo	Rose hips with peel, …	19111204	1
Caelo	Rose hips with peel, …	nachprüfung	2
Caelo	Rose hips with peel, …	2402211542	1
Caelo	Rose hips with peel, …	2103311542	1
Caelo	Rose hips with peel, …	1512211542	1
Caelo	Rose hips with peel, …	13097405	1
Caelo	Rose hips with peel, …	13048704	2
Caelo	Rose hips with peel, …	13048703	1
Caelo	Rose hips with peel, …	12064213	1
Caelo	Rose hips with peel, …	12064210	1
Caelo	Rose hips with peel, …	12064209	1
Caelo	Rose hips with peel, …	12064207	2
Caelo	Rose hips with peel, …	13048703	1
Caelo	Rose hips with peel, …	12029011	1
Caelo	Rose hips with peel, …	12064207	4
Caelo	Rose mallow flower, cut	10244507	1
Caelo	Rose mallow flower, cut	13040402	2
Caelo	Rose mallow flower, cut	13040401	3
Caelo	Rose mallow flower, cut	9267604	1
Caelo	Roselle	12267501	3
Caelo	Roselle	7121301	1
Caelo	Roselle	5212U-01460	1
Caelo	Roselle	11036509	1
Caelo	Roselle	12267504-3428311150	1
Caelo	Roselle	12267504	1
Caelo	Roselle	12267502	3
Caelo	Roselle	11036512	1
Caelo	Roselle	12007306	1
Caelo	Roselle	12007303	1
Caelo	Roselle	11036511	1
Caelo	Roselle	11036503	1
Caelo	Roselle	11036504	1
Caelo	Roselle	12267502	4
Caelo	Roselle	12267503	2
Caelo	Roselle	12267507	2
Caelo	Roselle	13010204	1
Caelo	Roselle	12267504	3
Caelo	Roselle	11036501	1
Caelo	Rosemary leaf, cut	12225902	1
Caelo	Rosemary leaf, cut	11193408	6
Caelo	Rosemary leaf, cut	13128801	1
Caelo	Rosemary leaf, cut	13128802	2
Caelo	Rosemary leaf, cut	15125008	1
Caelo	Rosemary leaf, cut	IntCh:313060	1
Caelo	Rosemary leaf, cut	11193407	1

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Supplier	Substance	Batch	Spectra
Caelo	Rosemary leaf, cut	13128805	1
Caelo	Rosemary leaf, cut	28051404	1
Caelo	Rosemary leaf, cut	11193405	1
Caelo	Rosemary leaf, cut	11193405	3
Caelo	Rosemary leaf, cut	1812A-01510	1
Caelo	Rosemary leaf, cut	14159602	1
Caelo	Rosemary leaf, cut	15125001	3
Caelo	Rosemary leaf, cut	14159601	1
Caelo	Rosemary leaf, cut	10139811	1
Caelo	Rosemary leaf, cut	1415901	1
Caelo	Rosemary leaf, cut	11193406	1
Caelo	Rosemary leaf, cut	14082901	1
Caelo	Rosemary leaf, cut	11193403	1
Caelo	Rosemary leaf, cut	13128806	3
Caelo	Rosemary leaf, cut	5041302	1
Caelo	Rosemary leaf, cut	11192408	1
Caelo	Rosemary leaf, cut	11193404	2
Caelo	Rosemary leaf, cut	14082902	1
Caelo	Rosemary leaf, cut	11193402	3
Caelo	Rue herb, cut		1
Caelo	Rue herb, cut	12148803	2
Caelo	Rue herb, cut	12148804	1
Caelo	Rue herb, cut	9336802	1
Caelo	Rue herb, cut	11371803	1
Caelo	Rue herb, cut	12148806	1
Caelo	Rue herb, cut	12148801	1
Caelo	Saffron filaments	10184811	2
Caelo	Saffron filaments	10184822	1
Caelo	Saffron filaments	11071310	1
Caelo	Saffron filaments	12108311	2
Caelo	Saffron filaments	15101305	1
Caelo	Saffron filaments	21011403	1
Caelo	Saffron filaments	12108308	2
Caelo	Sage leaf, cut	2301A140205	1
Caelo	Sage leaf, cut	12370015	2
Caelo	Sage leaf, cut	13266620	1
Caelo	Sage leaf, cut	2301A110420	3
Caelo	Sage leaf, cut	22111203	1
Caelo	Sage leaf, cut	12370014	9
Caelo	Sage leaf, cut	13266603	2
Caelo	Sage leaf, cut	22081203	1
Caelo	Sage leaf, cut	12370006	8
Caelo	Sage leaf, cut	12370017	1
Caelo	Sage leaf, cut	14111315	1
Caelo	Sage leaf, cut	140713b	1
Caelo	Sage leaf, cut	15041304	1
Caelo	Sage leaf, cut	15090103	1
Caelo	Sage leaf, cut	123770010	1
Caelo	Sage leaf, cut	12370013	5
Caelo	Sage leaf, cut	15090112	2
Caelo	Sage leaf, cut	13266626	1
Caelo	Sage leaf, cut	1513E-01513	1
Caelo	Sage leaf, cut	13266621	1
Caelo	Sage leaf, cut	17061302	1
Caelo	Sage leaf, cut	19071205	1
Caelo	Sage leaf, cut	20121201	1
Caelo	Sage leaf, cut	15121201	1
Caelo	Sage leaf, cut	22061201	1
Caelo	Sage leaf, cut	13011405	1
Caelo	Sage leaf, cut	23101203	1

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Supplier	Substance	Batch	Spectra
Caelo	Sage leaf, cut	11347503	1
Caelo	Sage leaf, cut	111012004	1
Caelo	Sage leaf, cut	11056125	3
Caelo	Sage leaf, cut	11056124	1
Caelo	Sage leaf, cut	9121302	1
Caelo	Sage leaf, cut	2301C130326	1
Caelo	Sage leaf, cut	410211513	1
Caelo	Sage leaf, cut	103311513	1
Caelo	Sage leaf, cut	279939	1
Caelo	Sage leaf, cut	11056108	3
Caelo	Sage leaf, cut	11347508	8
Caelo	Sage leaf, cut	11056104	1
Caelo	Sage leaf, cut	12370014-3541411092	1
Caelo	Sage leaf, cut	31081202	1
Caelo	Sage leaf, cut	12370014-3477312161	1
Caelo	Sage leaf, cut	12370011	12
Caelo	Sage leaf, cut	1104211513	1
Caelo	Sage leaf, cut	312010	1
Caelo	Sage leaf, cut	12370009	12
Caelo	Sage leaf, cut	12370003-3359319071	1
Caelo	Sage leaf, cut	11347512	1
Caelo	Sage leaf, cut	1237003	1
Caelo	Sage leaf, cut	31051315	1
Caelo	Sage leaf, cut	11347509	8
Caelo	Sage leaf, cut	8011420	1
Caelo	Sage leaf, cut	11347513	3
Caelo	Sage leaf, cut	13266605	4
Caelo	Sage leaf, cut	13266606	1
Caelo	Sage leaf, cut	24091204	1
Caelo	Sage leaf, cut	11347510	1
Caelo	Sage leaf, cut	25061302	1
Caelo	Sage leaf, cut	26081301	1
Caelo	Sage leaf, cut	12370004	2
Caelo	Sage leaf, cut	12370003	7
Caelo	Sage leaf, cut	12380009	1
Caelo	Sage leaf, cut	12112101	1
Caelo	Sage leaf, cut	12370001	19
Caelo	Sage leaf, cut	12021302	1
Caelo	Sage leaf, cut	1209211513	1
Caelo	Sarsaparilla root, cut	13079201	1
Caelo	Savory, rubbed	12177208	2
Caelo	Savory, rubbed	12200801	1
Caelo	Savory, rubbed	12177207	1
Caelo	Savory, rubbed	12177203	7
Caelo	Savory, rubbed	12177201	1
Caelo	Savory, rubbed	13172404	2
Caelo	Senna leaf, cut	3813E1514	1
Caelo	Senna leaf, cut	3212E-01514	1
Caelo	Senna leaf, cut	313082	1
Caelo	Senna leaf, cut	4113Q1514	1
Caelo	Senna leaf, cut	2909211514	1
Caelo	Senna leaf, cut	2413Q01514	1
Caelo	Senna leaf, cut	2231B13014	1
Caelo	Senna leaf, cut	13136724	2
Caelo	Senna leaf, cut	1803311514	1
Caelo	Senna leaf, cut	15101303	1
Caelo	Senna leaf, cut	1316706	1
Caelo	Senna leaf, cut	13136706	1
Caelo	Senna leaf, cut	9071302	1
Caelo	Senna leaf, cut	13136718	1

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Supplier	Substance	Batch	Spectra
Caelo	Senna leaf, cut	711211514	1
Caelo	Senna leaf, cut	13136709	1
Caelo	Senna leaf, cut	10126502	1
Caelo	Senna leaf, cut	14306324	1
Caelo	Senna leaf, cut	14306311	2
Caelo	Senna leaf, cut	11041009	1
Caelo	Senna leaf, cut	11277301	1
Caelo	Senna leaf, cut	11277312	1
Caelo	Senna leaf, cut	1316703	2
Caelo	Senna leaf, cut	14183805	3
Caelo	Senna leaf, cut	12273104	2
Caelo	Senna leaf, cut	12273101	6
Caelo	Senna leaf, cut	12115503	8
Caelo	Senna leaf, cut	111113a	1
Caelo	Senna leaf, cut	14306310	1
Caelo	Senna leaf, cut	21011401	1
Caelo	Senna leaf, cut	13136705	3
Caelo	Senna leaf, cut	12369903	1
Caelo	Senna leaf, cut	12276111	1
Caelo	Senna leaf, cut	12273113	3
Caelo	Senna leaf, cut	12273118	7
Caelo	Senna leaf, cut	12273105	7
Caelo	Senna leaf, cut	12115501	6
Caelo	Senna leaf, cut	5013U01514	1
Caelo	Senna leaf, cut	13136705-3489312103	1
Caelo	Senna leaf, cut	12273116	19
Caelo	Senna leaf, cut	12273115	11
Caelo	Senna leaf, cut	12273114	2
Caelo	Senna leaf, cut	12273111	11
Caelo	Senna leaf, cut	12273120	3
Caelo	Senna leaf, cut	12273119	4
Caelo	Senna leaf, cut	13136704	15
Caelo	Senna leaf, cut	1273103	1
Caelo	Senna leaf, cut	12273107	10
Caelo	Senna leaf, cut	18071201	1
Caelo	Senna leaf, cut	514R1514	1
Caelo	Senna leaf, cut	5091306	1
Caelo	Senna leaf, cut	103311514	2
Caelo	Senna leaf, cut	13136703	3
Caelo	Senna leaf, cut	2402221514	1
Caelo	Senna leaf, cut	2402211514	1
Caelo	Senna leaf, cut	131316701	1
Caelo	Senna leaf, cut	11277316	5
Caelo	Senna leaf, cut	12115502	1
Caelo	Senna leaf, cut	11277307	1
Caelo	Senna leaf, cut	11277304	5
Caelo	Senna leaf, cut	806211514	1
Caelo	Senna leaf, cut	12273106	3
Caelo	Senna leaf, powdered	11193307	1
Caelo	Senna leaf, powdered	14088703	1
Caelo	Senna pods, tinnevelly	122676707	1
Caelo	Senna pods, tinnevelly	12267602	2
Caelo	Senna pods, tinnevelly	12267606	1
Caelo	Senna pods, tinnevelly	12267609	1
Caelo	Senna pods, tinnevelly	12267610	1
Caelo	Senna pods, tinnevelly	22061202	1
Caelo	Senna pods, tinnevelly	12267605	1
Caelo	Senna pods, tinnevelly	12267201	1
Caelo	Senna pods, tinnevelly	12267609	4
Caelo	Senna pods, tinnevelly	110030009	1

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Supplier	Substance	Batch	Spectra
Caelo	Senna pods, tinnevelly	12267604	1
Caelo	Senna pods, tinnevelly	12267007	1
Caelo	Senna pods, tinnevelly	11003013	1
Caelo	Senna pods, tinnevelly	11003009	2
Caelo	Senna pods, tinnevelly	12267608	1
Caelo	Senna pods, tinnevelly	11003004	1
Caelo	Shepherd's purse, cut	10061301	1
Caelo	Shepherd's purse, cut	12354201	15
Caelo	Shepherd's purse, cut	11328208	6
Caelo	Shepherd's purse, cut	11328207	10
Caelo	Shepherd's purse, cut	11328201	8
Caelo	Shepherd's purse, cut	12354203-3396310111	1
Caelo	Shepherd's purse, cut	11328203	7
Caelo	Shepherd's purse, cut	12354203	11
Caelo	Shepherd's purse, cut	12354207	2
Caelo	Shepherd's purse, cut	11036404	2
Caelo	Shepherd's purse, cut	11036406	8
Caelo	Shepherd's purse, cut	11091202	1
Caelo	Shepherd's purse, cut	11328202	1
Caelo	Shepherd's purse, cut	11328204	4
Caelo	Shepherd's purse, cut	11036401	1
Caelo	Shepherd's purse, cut	4411E-01625	1
Caelo	Shepherd's purse, cut	15101202	1
Caelo	Shepherd's purse, cut	14061201	1
Caelo	Shepherd's purse, cut	13344203	1
Caelo	Shepherd's purse, cut	12354503	1
Caelo	Shepherd's purse, cut	12354209	1
Caelo	Shepherd's purse, cut	12354206	4
Caelo	Shepherd's purse, cut	12354205	6
Caelo	Shepherd's purse, cut	12354204	20
Caelo	Shepherd's purse, cut	12354202	2
Caelo	Shepherd's purse, cut	12254202	1
Caelo	Shepherd's purse, cut	11328209	7
Caelo	Shepherd's purse, cut	11328206	2
Caelo	Shepherd's purse, cut	11328205	2
Caelo	Shepherd's purse, cut	1132820111-14	1
Caelo	Shepherd's purse, cut	3121301	1
Caelo	Silverweed, cut	11328110	1
Caelo	Silverweed, cut	20081202	1
Caelo	Silverweed, cut	9362606	1
Caelo	Silverweed, cut	8111204	1
Caelo	Silverweed, cut	11016405	1
Caelo	Silverweed, cut	11326102	1
Caelo	Silverweed, cut	11328103	5
Caelo	Silverweed, cut	11328104	1
Caelo	Silverweed, cut	11328105	7
Caelo	Silverweed, cut	11328109	15
Caelo	Silverweed, cut	9362614	1
Caelo	Silverweed, cut	13410801	1
Caelo	Silverweed, cut	5012E-01619	1
Caelo	Silverweed, cut	11016404	1
Caelo	Silverweed, cut	11016404	1
Caelo	Silverweed, cut	11016401	1
Caelo	Silverweed, cut	11016407	2
Caelo	Silverweed, cut	11016409	3
Caelo	Silverweed, cut	11328112	2
Caelo	Sodium carbonate deca…	80136428	1
Caelo	Sodium carbonate deca…	80136179	1
Caelo	Sodium carbonate deca…	13036910	1
Caelo	Sodium carbonate deca…	13036909	1

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Supplier	Substance	Batch	Spectra
Caelo	Sodium carbonate deca…	13036907	1
Caelo	Sodium carbonate deca…	12239806	1
Caelo	Sodium carbonate deca…	12239810	3
Caelo	Sodium carbonate deca…	11254708	2
Caelo	Sodium carbonate deca…	11254706	1
Caelo	Sodium carbonate deca…	13036902	3
Caelo	Sodium dihydrogen pho…	11277504	1
Caelo	Sodium dihydrogen pho…	13D08-N25	1
Caelo	Sodium dihydrogen pho…	12198510	2
Caelo	Sodium dihydrogen pho…	12198517	3
Caelo	Sodium dihydrogen pho…	15122808	1
Caelo	Sodium dihydrogen pho…	12198506	1
Caelo	Sodium hydrogen carbo…	3012Q-01892	1
Caelo	Sodium hydrogen carbo…	13060104	1
Caelo	Sodium hydrogen carbo…	12324703	1
Caelo	Sodium hydrogen carbo…	12132213	1
Caelo	Sodium hydrogen carbo…	11304809	2
Caelo	Sodium hydrogen carbo…	13060117	1
Caelo	Sodium hydrogen carbo…	12356407	2
Caelo	Sodium hydrogen carbo…	12356403	1
Caelo	Sodium hydrogen carbo…	12356401	4
Caelo	Sodium hydrogen carbo…	12356303	3
Caelo	Sodium hydrogen carbo…	1234702	2
Caelo	Sodium hydrogen carbo…	12324725	2
Caelo	Sodium hydrogen carbo…	12324708	1
Caelo	Sodium hydrogen carbo…	12324702	9
Caelo	Sodium hydrogen carbo…	1219204	1
Caelo	Sodium hydrogen carbo…	12132503	1
Caelo	Sodium hydrogen carbo…	12132219	10
Caelo	Sodium hydrogen carbo…	12132204	11
Caelo	Sodium hydrogen carbo…	12132203	4
Caelo	Sodium hydrogen carbo…	12109205	7
Caelo	Sodium hydrogen carbo…	1203030-1	1
Caelo	Sodium hydrogen carbo…	8101203	1
Caelo	Sodium hydrogen carbo…	12109202	1
Caelo	Sodium hydrogen carbo…	21081204	1
Caelo	Sodium hydrogen carbo…	12109204	6
Caelo	Sodium hydrogen carbo…	13186705	3
Caelo	Sodium hydrogen carbo…	6011404	1
Caelo	Sodium hydrogen carbo…	3313I-01892	1
Caelo	Sodium hydrogen carbo…	15328602	1
Caelo	Sodium hydrogen carbo…	13390520	1
Caelo	Sodium hydrogen carbo…	13390505	1
Caelo	Sodium hydrogen carbo…	13234205	1
Caelo	Sodium hydrogen carbo…	11304813	2
Caelo	Sodium hydrogen carbo…	13060103	12
Caelo	Sodium hydrogen carbo…	13234007	4
Caelo	Sodium hydrogen carbo…	13234005	4
Caelo	Sodium hydrogen carbo…	13234202	3
Caelo	Sodium hydrogen carbo…	13186721	1
Caelo	Sodium hydrogen carbo…	13186706	1
Caelo	Sodium hydrogen carbo…	13186704	1
Caelo	Sodium hydrogen carbo…	1307017-02	1
Caelo	Sodium hydrogen carbo…	130701701	1
Caelo	Sodium hydrogen carbo…	1307017-01	2
Caelo	Sodium hydrogen carbo…	13060120	7
Caelo	Sodium hydrogen carbo…	13186711	1
Caelo	Sodium hydrogen carbo…	13234004	2
Caelo	Sodium hydrogen carbo…	11304802	3
Caelo	Sodium hydroxide pell…	15312102	1

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Supplier	Substance	Batch	Spectra
Caelo	Sodium hydroxide pell…	11070821	1
Caelo	Sodium hydroxide pell…	12368105	2
Caelo	Sodium monohydrogenph…	12345001	7
Caelo	Sodium monohydrogenph…	9302617	1
Caelo	Sodium monohydrogenph…	9302613	2
Caelo	Sodium monohydrogenph…	12256606	5
Caelo	Sodium monohydrogenph…	12345025	1
Caelo	Sodium monohydrogenph…	12345016	9
Caelo	Sodium monohydrogenph…	83002059	1
Caelo	Sodium monohydrogenph…	12345004	8
Caelo	Sodium monohydrogenph…	12345007	6
Caelo	Sodium monohydrogenph…	AKD7	1
Caelo	Sodium monohydrogenph…	12256602	4
Caelo	Sodium monohydrogenph…	71199028	1
Caelo	Sodium monohydrogenph…	1169315	1
Caelo	Sodium monohydrogenph…	28131-01914	1
Caelo	Sodium monohydrogenph…	11169309	3
Caelo	Sodium monohydrogenph…	11169303	2
Caelo	Sodium monohydrogenph…	11169315	4
Caelo	Sodium monohydrogenph…	11169301	1
Caelo	Sodium monohydrogenph…	11169321	1
Caelo	Sodium monohydrogenph…	8300209	1
Caelo	Sodium monohydrogenph…	13028103	1
Caelo	Sodium monohydrogenph…	13028003	1
Caelo	Sodium monohydrogenph…	13028001	4
Caelo	Sodium monohydrogenph…	12109003	3
Caelo	Sodium monohydrogenph…	11109513	1
Caelo	Sodium monohydrogenph…	12109109	1
Caelo	Sodium monohydrogenph…	12109108	2
Caelo	Sodium monohydrogenph…	12109106	2
Caelo	Sodium monohydrogenph…	12109101	2
Caelo	Sodium monohydrogenph…	12109002	4
Caelo	Sodium monohydrogenph…	10135304	1
Caelo	Sodium monohydrogenph…	12109102	1
Caelo	Sodium monohydrogenph…	12109104	1
Caelo	Sodium monohydrogenph…	72006059	1
Caelo	Sodium perborate, hyd…	13050807	1
Caelo	Sodium perborate, hyd…	13050805	2
Caelo	Sodium perborate, hyd…	13050801	2
Caelo	Sodium sulfate decahy…	12157013	4
Caelo	Sodium sulfate decahy…	205026	1
Caelo	Sodium sulfate decahy…	70706387	1
Caelo	Sodium sulfate decahy…	12257902	8
Caelo	Sodium sulfate decahy…	12157007	1
Caelo	Sodium sulfate decahy…	12157012	23
Caelo	Sodium sulfate decahy…	12157006	11
Caelo	Sodium sulfate decahy…	12157011	1
Caelo	Sodium sulfate decahy…	12157001	4
Caelo	Sodium sulfate decahy…	12157017	1
Caelo	Sodium sulfate decahy…	11294605	2
Caelo	Sodium sulfate decahy…	11294504	1
Caelo	Sodium sulfate decahy…	61599506	1
Caelo	Sodium sulfate decahy…	11294501	1
Caelo	Sodium sulfate decahy…	11012210	2
Caelo	Sodium sulfate decahy…	11012207	1
Caelo	Sodium sulfate decahy…	18101202	1
Caelo	Sodium sulfate decahy…	12257901	11
Caelo	Sodium sulfate decahy…	12256902	1
Caelo	Sodium sulfate decahy…	12157005	20
Caelo	Sodium sulfate decahy…	2013A-01920	1

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Supplier	Substance	Batch	Spectra
Caelo	Sodium thiosulfate pe…	26041302	1
Caelo	Sodium thiosulfate pe…	80426288	1
Caelo	Solanum dulcamara ste…	10375604	2
Caelo	Solanum dulcamara ste…	4712M-02335	1
Caelo	Solanum dulcamara ste…	132564301	1
Caelo	Solanum dulcamara ste…	13254301	1
Caelo	Solanum dulcamara ste…	10375605	1
Caelo	Solanum dulcamara ste…	103745604	1
Caelo	Solanum dulcamara ste…	10375603	2
Caelo	Sorrel herb, cut	130546	1
Caelo	Sorrel herb, cut	11165310	1
Caelo	Sorrel herb, cut	11165302	1
Caelo	Sorrel herb, cut	13289502	2
Caelo	Sour cherry stems, cut	10367014	1
Caelo	Sour cherry stems, cut	12042301	1
Caelo	Sour cherry stems, cut	12042307	1
Caelo	Sour cherry stems, cut	10367019	1
Caelo	Spearmint leaf, cut	12376706	2
Caelo	Spearmint leaf, cut	13105001	12
Caelo	Spearmint leaf, cut	12133909	1
Caelo	Spearmint leaf, cut	13105003	1
Caelo	Spearmint leaf, cut	12133906	2
Caelo	Spearmint leaf, cut	12133901	3
Caelo	Spearmint leaf, cut	1512Q-01505	1
Caelo	Spearmint leaf, cut	11037409+110374	1
Caelo	St. John's wort, cut	16041301	1
Caelo	St. John's wort, cut	11185607	2
Caelo	St. John's wort, cut	15068105	1
Caelo	St. John's wort, cut	268913	1
Caelo	St. John's wort, cut	30011401	1
Caelo	St. John's wort, cut	3213A-01655	1
Caelo	St. John's wort, cut	3956/V07/14	1
Caelo	St. John's wort, cut	4021A100819	3
Caelo	St. John's wort, cut	11185608	22
Caelo	St. John's wort, cut	132203204	1
Caelo	St. John's wort, cut	13203205	1
Caelo	St. John's wort, cut	13203204	7
Caelo	St. John's wort, cut	11185602	2
Caelo	St. John's wort, cut	1185608	1
Caelo	St. John's wort, cut	111185608	1
Caelo	St. John's wort, cut	12092201	2
Caelo	St. John's wort, cut	9297304	1
Caelo	St. John's wort, cut	12092203	1
Caelo	St. John's wort, cut	11185605	6
Caelo	St. John's wort, cut	5061208	1
Caelo	St. John's wort, cut	12092204	1
Caelo	St. John's wort, cut	12092202	8
Caelo	St. John's wort, cut	12092209	2
Caelo	St. John's wort, cut	11185603	1
Caelo	St. John's wort, cut	13091303	1
Caelo	St. John's wort, cut	5021301	1
Caelo	St. John's wort, cut	4021B110321	1
Caelo	Star anise	12226211	1
Caelo	Star anise	11314104	1
Caelo	Star anise	10376405	1
Caelo	Star anise	10169101	1
Caelo	Star anise	5111206	1
Caelo	Star anise	11314103	3
Caelo	Stemless carline root	12163701	3
Caelo	Stemless carline root	25111306	1

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Supplier	Substance	Batch	Spectra
Caelo	Stemless carline root	14347401	1
Caelo	Stemless carline root	13130301	8
Caelo	Stemless carline root	13033501	1
Caelo	Stemless carline root	23071203	1
Caelo	Stemless carline root	12232803	1
Caelo	Stemless carline root	13130303	1
Caelo	Stemless carline root	13130304	1
Caelo	Stemless carline root	13130903	1
Caelo	Stemless carline root	12144804	1
Caelo	Strawberry leaf, cut	4512A-01490	1
Caelo	Strawberry leaf, cut	11117909	1
Caelo	Strawberry leaf, cut	5122013c	1
Caelo	Sulfamerazine	10218401	1
Caelo	Sunflower, cut	313A-03521	1
Caelo	Sweet woodruff herb, …	52236077	1
Caelo	Sweet woodruff herb, …	10375802	1
Caelo	Sweet woodruff herb, …	10375812	2
Caelo	Sweet woodruff herb, …	91789309	1
Caelo	Sweet woodruff herb, …	12103509	3
Caelo	Sweet woodruff herb, …	18031304	1
Caelo	Sweet woodruff herb, …	4409M-01621	1
Caelo	Sweet woodruff herb, …	12103510	1
Caelo	Sweet woodruff herb, …	10375809	2
Caelo	Sweet woodruff herb, …	12103513	2
Caelo	Sweet woodruff herb, …	12103514	1
Caelo	Sweet woodruff herb, …	nachprüfung	2
Caelo	Talcum	28121201	1
Caelo	Talcum	15061301	1
Caelo	Talcum	12267401	5
Caelo	Talcum	11318335	4
Caelo	Talcum	2011406	1
Caelo	Talcum	12267424	6
Caelo	Talcum	12267412	8
Caelo	Talcum	11318324	4
Caelo	Talcum	11164306	2
Caelo	Talcum	11164313	1
Caelo	Talcum	11318301	1
Caelo	Talcum	1205046-01	3
Caelo	Talcum	11318311	3
Caelo	Talcum	9218303	1
Caelo	Talcum	12111301	1
Caelo	Talcum	11318312	2
Caelo	Talcum	13146302	11
Caelo	Talcum	11318323	1
Caelo	Talcum	13146307	4
Caelo	Talcum	13146308	7
Caelo	Talcum	13146312	5
Caelo	Talcum	13146315	1
Caelo	Talcum	13146316	3
Caelo	Talcum	12267423	3
Caelo	Tall golden rod, cut	12343103	18
Caelo	Tall golden rod, cut	12343106	1
Caelo	Tall golden rod, cut	nachprüfung	1
Caelo	Tall golden rod, cut	12343108	1
Caelo	Tall golden rod, cut	6081302	1
Caelo	Tall golden rod, cut	112080308	1
Caelo	Tall golden rod, cut	4091302	1
Caelo	Tall golden rod, cut	4021405	1
Caelo	Tall golden rod, cut	2656153	1
Caelo	Tall golden rod, cut	11280308	14

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Supplier	Substance	Batch	Spectra
Caelo	Tall golden rod, cut	11280305	3
Caelo	Tall golden rod, cut	11280301	8
Caelo	Tall golden rod, cut	11207010	3
Caelo	Tall golden rod, cut	11085605	2
Caelo	Tall golden rod, cut	14112012	1
Caelo	Tall golden rod, cut	12343104	9
Caelo	Tall golden rod, cut	13049001	1
Caelo	Tall golden rod, cut	20111209	1
Caelo	Tall golden rod, cut	11280309	3
Caelo	Tall golden rod, cut	1810201204	1
Caelo	Tall golden rod, cut	17091203	1
Caelo	Tall golden rod, cut	11280310	6
Caelo	Tall golden rod, cut	12319002	2
Caelo	Tall golden rod, cut	12319003	24
Caelo	Tall golden rod, cut	15061203	1
Caelo	Tall golden rod, cut	12319004	13
Caelo	Tall golden rod, cut	28051302	1
Caelo	Tall golden rod, cut	11280307	1
Caelo	Tall golden rod, cut	2513A-01684	1
Caelo	Tall golden rod, cut	14018404	1
Caelo	Tall golden rod, cut	314050-1-p	1
Caelo	Tall golden rod, cut	4113A-01684	1
Caelo	Tall golden rod, cut	13386901	2
Caelo	Tall golden rod, cut	12319006	6
Caelo	Tall golden rod, cut	12343109	1
Caelo	Tall golden rod, cut	12319007	31
Caelo	Tall golden rod, cut	12343105	1
Caelo	Tall golden rod, cut	12336801	1
Caelo	Tall golden rod, cut	12343101	3
Caelo	Tall golden rod, cut	12343102	5
Caelo	Tall golden rod, cut	13386903	1
Caelo	Tall golden rod, cut	27121302	1
Caelo	Tall hawkweed, cut	3611b111005	1
Caelo	Tall hawkweed, cut	3611B111005	2
Caelo	Tall nasturtium herb,...	13104403	5
Caelo	Tall nasturtium herb,...	13104405	1
Caelo	Tall nasturtium herb,...	13104402	2
Caelo	Tall nasturtium herb,...	13104401	4
Caelo	Tall nasturtium herb,...	12031606	1
Caelo	Tall nasturtium herb,...	12031605	1
Caelo	Tall nasturtium herb,...	12031604	2
Caelo	Tall nasturtium herb,...	12031603	1
Caelo	Tall nasturtium herb,...	13104404	2
Caelo	Tall nasturtium herb,...	12031602	1
Caelo	Tall nasturtium herb,...	107063	1
Caelo	Tall nasturtium herb,...	10224507	1
Caelo	Tall nasturtium herb,...	13104406	1
Caelo	Tall nasturtium herb,...	12031601	1
Caelo	Theriac, powdered	13407304	2
Caelo	Theriac, powdered	12289307	9
Caelo	Theriac, powdered	11081515	1
Caelo	Theriac, powdered	12289304	1
Caelo	Theriac, powdered	14156501	1
Caelo	Theriac, powdered	12189401	4
Caelo	Theriac, powdered	15312501	1
Caelo	Theriac, powdered	412091-2P	1
Caelo	Theriac, powdered	1513E-01351	1
Caelo	Theriac, powdered	4714M-07000	1
Caelo	Theriac, powdered	15101307	1
Caelo	Theriac, powdered	15026403	1

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Supplier	Substance	Batch	Spectra
Caelo	Theriac, powdered	13407306	1
Caelo	Theriac, powdered	13407303	1
Caelo	Theriac, powdered	12289312	1
Caelo	Theriac, powdered	12289306	1
Caelo	Theriac, powdered	15312504	2
Caelo	Theriac, powdered	11082409	1
Caelo	Theriac, powdered	12289303	1
Caelo	Theriac, powdered	12289301	4
Caelo	Theriac, powdered	12189404	2
Caelo	Theriac, powdered	11082413	1
Caelo	Theriac, powdered	11082408	1
Caelo	Theriac, powdered	2021301	1
Caelo	Theriac, powdered	12289305	3
Caelo	Thiomersal	10296413	1
Caelo	Thiomersal	21051507	1
Caelo	Thyme, rubbed	16011401	1
Caelo	Thyme, rubbed	21121204	1
Caelo	Thyme, rubbed	1021307	1
Caelo	Thyme, rubbed	11345001	2
Caelo	Thyme, rubbed	25091304	1
Caelo	Thyme, rubbed	10365807	4
Caelo	Thyme, rubbed	10365803	1
Caelo	Thyme, rubbed	9366310	1
Caelo	Thyme, rubbed	4622A110728	40
Caelo	Thyme, rubbed	273909	4
Caelo	Thyme, rubbed	11345006	9
Caelo	Thyme, rubbed	11345004	6
Caelo	Thyme, rubbed	26021301	1
Caelo	Thyme, rubbed	4041301	1
Caelo	Thyme, rubbed	29011303	1
Caelo	Thyme, rubbed		2
Caelo	Thyme, rubbed	4021512	1
Caelo	Thyme, rubbed	1213Q-01688	1
Caelo	Thyme, rubbed	130448301	1
Caelo	Thyme, rubbed	13048302	2
Caelo	Thyme, rubbed	13048313	2
Caelo	Thyme, rubbed	13048314	1
Caelo	Thyme, rubbed	15104301	1
Caelo	Thyme, rubbed	22021301	1
Caelo	Thyme, rubbed	25091208	1
Caelo	Thyme, rubbed	29101301	1
Caelo	Thyme, rubbed	10365815	5
Caelo	Thyme, rubbed	6111205	1
Caelo	Thyme, rubbed	10365816	3
Caelo	Thyme, rubbed	11021301	1
Caelo	Thyme, rubbed	13048309-3475312161	1
Caelo	Thyme, rubbed	11345011	19
Caelo	Thyme, rubbed	8061206	1
Caelo	Thyme, rubbed	15104401	1
Caelo	Thyme, rubbed	15101201	1
Caelo	Thyme, rubbed	14119001	2
Caelo	Thyme, rubbed	23021304	1
Caelo	Thyme, rubbed	13081301	1
Caelo	Thyme, rubbed	13048309	6
Caelo	Thyme, rubbed	13048308	2
Caelo	Thyme, rubbed	4622A120111	57
Caelo	Thyme, rubbed	13011402	1
Caelo	Thyme, rubbed	13048301	19
Caelo	Thyme, rubbed	1134006	1
Caelo	Thyme, rubbed	11345003	2

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Supplier	Substance	Batch	Spectra
Caelo	Thyme, rubbed	25041302	1
Caelo	Thyme, rubbed	11121306	1
Caelo	Thyme, rubbed	11345010	7
Caelo	Thyme, rubbed	11345013	7
Caelo	Thyme, rubbed	1134514	1
Caelo	Thyme, rubbed	12111201	1
Caelo	Tonka beans	12145101	3
Caelo	Tonka beans	1078C	1
Caelo	Tonka beans	12144101	1
Caelo	Tonka beans	20111312	1
Caelo	Tormentil	15178202	2
Caelo	Tormentil	15085501	1
Caelo	Tormentil	14140001	1
Caelo	Tormentil	14008005	1
Caelo	Tormentil	14008002	2
Caelo	Tormentil	15178206	1
Caelo	Tormentil	12216801	5
Caelo	Tormentil	12216806	1
Caelo	Tormentil	521305-420	1
Caelo	Tormentil	15178203	1
Caelo	Tormentil	14360103	1
Caelo	Tormentil	15364302	3
Caelo	Tormentil	14140006	4
Caelo	Tormentil	12040701	1
Caelo	Tormentil	14008001	3
Caelo	Tormentil	10081203	1
Caelo	Tormentil	1914A-02188	1
Caelo	Tormentil	13220502	1
Caelo	Tormentil	4753268	1
Caelo	Tormentil	411082-2-P	1
Caelo	Tormentil	30011405	1
Caelo	Tormentil	25022014A	1
Caelo	Tormentil	12216805	1
Caelo	Tormentil	12216803	4
Caelo	Tormentil	2512A-02188	1
Caelo	Tormentil	12040717	1
Caelo	Tormentil	12040715	1
Caelo	Tormentil	12040709	1
Caelo	Tormentil	12040707	1
Caelo	Tormentil	12040704	2
Caelo	Tormentil	12040702	1
Caelo	Tormentil	12216802	1
Caelo	Tormentil	11102011	1
Caelo	Tormentil	11102010	2
Caelo	Tragacanth, powdered	9081202	1
Caelo	Tragacanth, powdered	7021402	1
Caelo	Tragacanth, powdered	16110802	1
Caelo	Tragacanth, powdered	15085602	4
Caelo	Tragacanth, powdered	15085606	5
Caelo	Tragacanth, powdered	14162207	1
Caelo	Tragacanth, powdered	11128905	1
Caelo	Tragacanth, powdered	15085607	1
Caelo	Tragacanth, powdered	12108801	1
Caelo	Tragacanth, powdered	14011302	1
Caelo	Tragacanth, powdered	12285403	4
Caelo	Tragacanth, powdered	13095203	1
Caelo	Tragacanth, powdered	13095208	3
Caelo	Tragacanth, powdered	15041302	1
Caelo	Tragacanth, powdered	15041303	2
Caelo	Tragacanth, powdered	15121203	1

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Supplier	Substance	Batch	Spectra
Caelo	Tragacanth, powdered	20111305	1
Caelo	Tragacanth, powdered	14162207	2
Caelo	Tragacanth, powdered	13277804	3
Caelo	Tragacanth, powdered	8081201	1
Caelo	Tragacanth, powdered	15085602	1
Caelo	Tragacanth, powdered	12285402	1
Caelo	Tragacanth, powdered	14162205	7
Caelo	Tragacanth, powdered	14162204	1
Caelo	Tragacanth, powdered	13277801	1
Caelo	Tragacanth, powdered	13204703	3
Caelo	Tragacanth, powdered	12285408	1
Caelo	Tragacanth, powdered	12285405	1
Caelo	Tragacanth, powdered	1228503	1
Caelo	Tragacanth, powdered	1327802	1
Caelo	Tragacanth, powdered	12108806	2
Caelo	Tragacanth, powdered	13204701	6
Caelo	Tragacanth, powdered	13204705	7
Caelo	Tragacanth, powdered	13204702	1
Caelo	Tragacanth, powdered	13277802	4
Caelo	Tricalcium phosphate	1056303	1
Caelo	Trichloroacetic acid	3071204	1
Caelo	Trichloroacetic acid	6091306	1
Caelo	Trichloroacetic acid	10130802	1
Caelo	Trichloroacetic acid	12g04m11	1
Caelo	Trichloroacetic acid	12135207	5
Caelo	Trichloroacetic acid	11011306	1
Caelo	Trichloroacetic acid	12135201	1
Caelo	Trichloroacetic acid	12135203	1
Caelo	Trichloroacetic acid	12135210	4
Caelo	Trichloroacetic acid	13056203	3
Caelo	Trichloroacetic acid	13056209	1
Caelo	Trichloroacetic acid	13056212	1
Caelo	Trichloroacetic acid	10379401	3
Caelo	Trichloroacetic acid	13056213	1
Caelo	Turmeric root, cut	12136501	2
Caelo	Turmeric root, cut	13360204	2
Caelo	Turmeric root, cut	11160405	1
Caelo	Turmeric root, cut	15207601	1
Caelo	Turmeric root, cut	15158001	2
Caelo	Turmeric root, cut	1213650	1
Caelo	Turmeric root, cut	12136506	2
Caelo	Turmeric root, cut	12136507	1
Caelo	Turmeric root, cut	15158001	2
Caelo	Turmeric root, cut	15372603	1
Caelo	Turmeric root, cut	12136504	2
Caelo	Turmeric root, cut	12136503	2
Caelo	Turmeric root, cut	12136505	1
Caelo	Turmeric, javanese, cut	11182903	1
Caelo	Turmeric, javanese, cut	14309503	1
Caelo	Turmeric, javanese, cut	14017706	1
Caelo	Turmeric, javanese, cut	13262903	1
Caelo	Turmeric, javanese, cut	12319201	1
Caelo	Turmeric, javanese, cut	12319206	3
Caelo	Turmeric, javanese, cut	13262907	1
Caelo	Turmeric, javanese, cut	25041313	1
Caelo	Turmeric, javanese, cut	11046305	1
Caelo	Turmeric, javanese, cut	15120202	2
Caelo	Turmeric, javanese, cut	12319206	2
Caelo	Valerian root, cut	12033812	11
Caelo	Valerian root, cut	12033811	6

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Supplier	Substance	Batch	Spectra
Caelo	Valerian root, cut	1203804	1
Caelo	Valerian root, cut	1203812	1
Caelo	Valerian root, cut	31121201	1
Caelo	Valerian root, cut	12033808	7
Caelo	Valerian root, cut	13119001	1
Caelo	Valerian root, cut	12033806	1
Caelo	Valerian root, cut	12033805	5
Caelo	Valerian root, cut	120338012	1
Caelo	Valerian root, cut	11103612	4
Caelo	Valerian root, cut	11103611	1
Caelo	Valerian root, cut	12033810	1
Caelo	Valerian root, cut	13119002	20
Caelo	Valerian root, cut	13119003	14
Caelo	Valerian root, cut	1319002	1
Caelo	Valerian root, cut	31101202	1
Caelo	Valerian root, cut	29101303	1
Caelo	Valerian root, cut	28101303	1
Caelo	Valerian root, cut	2712A-02167	1
Caelo	Valerian root, cut	20081303	1
Caelo	Valerian root, cut	15175208	2
Caelo	Valerian root, cut	15175205	1
Caelo	Valerian root, cut	15175202	2
Caelo	Valerian root, cut	14179404	3
Caelo	Valerian root, cut	14179403	1
Caelo	Valerian root, cut	13287402	3
Caelo	Valerian root, cut	1328	1
Caelo	Valerian root, cut	13196806	6
Caelo	Valerian root, cut	13196805	1
Caelo	Valerian root, cut	13196802	6
Caelo	Valerian root, cut	11035002	1
Caelo	Valerian root, cut	13196801-3564412081	1
Caelo	Valerian root, cut	13196801	1
Caelo	Valerian root, cut	1319003	1
Caelo	Valerian root, cut	13119004	3
Caelo	Valerian root, cut	3091202	1
Caelo	Valerian root, cut	12033807	1
Caelo	Valerian root, cut	11103608	1
Caelo	Valerian root, cut	11349101	5
Caelo	Valerian root, cut	11103601	2
Caelo	Valerian root, cut	nachprüfung	1
Caelo	Valerian root, cut	11103606	1
Caelo	Valerian root, cut	11103602	2
Caelo	Valerian root, cut	11103607	6
Caelo	Valerian root, powdered	15175204	1
Caelo	Valerian root, powdered	13287402	3
Caelo	Valerian root, powdered	13196809	1
Caelo	Valerian root, powdered	13196806	1
Caelo	Valerian root, powdered	13196802	1
Caelo	Verbena herb, cut	12178601	1
Caelo	Verbena herb, cut	11031109	1
Caelo	Verbena herb, cut	11031102	1
Caelo	Verbena herb, cut	11031101	1
Caelo	Verbena herb, cut	110031110	1
Caelo	Verbena herb, cut	11031108	11
Caelo	Verbena herb, cut	6111301	1
Caelo	Verbena herb, cut	11031110	6
Caelo	Verbena herb, cut	12187601	16
Caelo	Verbena herb, cut	11031107	2
Caelo	Verbena herb, cut	11031105	3
Caelo	Verbena herb, cut	10034903	1

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Supplier	Substance	Batch	Spectra
Caelo	Verbena herb, cut	12188202	11
Caelo	Verbena herb, cut	11031103	2
Caelo	Verbena herb, cut	12383002	2
Caelo	Verbena herb, cut	12188203	6
Caelo	Verbena herb, cut	4651b120611	1
Caelo	Verbena herb, cut	3013E-01691	1
Caelo	Verbena herb, cut	2x12188202	1
Caelo	Verbena herb, cut	19111205	1
Caelo	Verbena herb, cut	11031106	7
Caelo	Verbena herb, cut	13351401	1
Caelo	Verbena herb, cut	13151003	5
Caelo	Verbena herb, cut	13151001	17
Caelo	Verbena herb, cut	15012405	1
Caelo	Verbena herb, cut	12383005	1
Caelo	Walnut bark, cut	11325603	2
Caelo	Walnut bark, cut	11325605	2
Caelo	Walnut bark, cut	11325606	2
Caelo	Walnut bark, cut	11016602	1
Caelo	Walnut bark, cut	11016604	2
Caelo	Walnut bark, cut	11016605	2
Caelo	Walnut leaf, cut	11103007	8
Caelo	Walnut leaf, cut	11103008	6
Caelo	Walnut leaf, cut	1414Q01499	1
Caelo	Walnut leaf, cut	12124605	8
Caelo	Walnut leaf, cut	12124502	1
Caelo	Walnut leaf, cut	11103003	3
Caelo	Walnut leaf, cut	12124607	1
Caelo	Walnut leaf, cut	14064902	3
Caelo	Walnut leaf, cut	14064903	1
Caelo	Walnut leaf, cut	14064904	6
Caelo	Walnut leaf, cut	14064906	4
Caelo	Walnut leaf, cut	8071502	1
Caelo	Walnut leaf, cut	10050413	1
Caelo	Walnut leaf, cut	15126004	1
Caelo	Walnut leaf, cut	15126003	5
Caelo	Walnut leaf, cut	nachprüfung	2
Caelo	Walnut leaf, cut	4713U01499	1
Caelo	Walnut leaf, cut	3712Q-01499	1
Caelo	Walnut leaf, cut	11103004	6
Caelo	Walnut leaf, cut	1313M-01499	1
Caelo	Walnut leaf, cut	1214603	1
Caelo	Walnut leaf, cut	12124604	1
Caelo	Walnut leaf, cut	12124602	3
Caelo	Walnut leaf, cut	12124601	8
Caelo	Walnut leaf, cut	11103010	7
Caelo	Walnut leaf, cut	11103005	1
Caelo	Walnut leaf, cut	11103001	2
Caelo	Walnut leaf, cut	414Q1499	1
Caelo	Walnut leaf, cut	3051301	1
Caelo	Walnut leaf, cut	25041404	1
Caelo	Walnut leaf, cut	15126002	1
Caelo	Walnut leaf, cut	11103002	1
Caelo	Walnut leaf, cut	15126008	4
Caelo	Walnut leaf, cut	14064909	2
Caelo	Walnut leaf, cut	12124603-341930192	1
Caelo	Walnut leaf, cut	12124603	17
Caelo	Walnut leaf, cut	11103009	1
Caelo	Walnut leaf, cut	14064910	1
Caelo	White deadnettle flower	15299101	1
Caelo	White deadnettle flower	12275802	1

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Supplier	Substance	Batch	Spectra
Caelo	White deadnettle flower	11371611	2
Caelo	White deadnettle flower	11371609	3
Caelo	White deadnettle flower	11371604	1
Caelo	White deadnettle flower	11371613	2
Caelo	White deadnettle flower	2101301	1
Caelo	White deadnettle flower	10081206	1
Caelo	White deadnettle flower	11371608	1
Caelo	White deadnettle flower	11371610	5
Caelo	White deadnettle flower	12152402	2
Caelo	White deadnettle flower	52470437	1
Caelo	White deadnettle flower	9231005	1
Caelo	White deadnettle herb…	11371712	1
Caelo	White deadnettle herb…	pzn4269354	1
Caelo	White deadnettle herb…	11371701	1
Caelo	White deadnettle herb…	11371703	1
Caelo	White deadnettle herb…	1137170301-15	1
Caelo	White deadnettle herb…	11371705	1
Caelo	White deadnettle herb…	11371702	1
Caelo	White deadnettle herb…	11371707	1
Caelo	White deadnettle herb…	11371708	5
Caelo	White deadnettle herb…	11371709	1
Caelo	White deadnettle herb…	11371711	2
Caelo	White deadnettle herb…	11371706	3
Caelo	White mustard seed, p…	12375702	1
Caelo	White mustard seed, p…	13224804	3
Caelo	White mustard seed, p…	12375704	1
Caelo	White mustard seed, p…	7254a110823	1
Caelo	White mustard seed, p…	13224801	1
Caelo	White mustard seed, p…	12375701	1
Caelo	White mustard seed, p…	12375705	4
Caelo	White mustard seed, p…	12375706	2
Caelo	White mustard seed, p…	12375705	1
Caelo	Wild apple, sweet	11229805	1
Caelo	Wild pansy, cut	12189203	4
Caelo	Wild pansy, cut	13091205	1
Caelo	Wild pansy, cut	12189204	10
Caelo	Wild pansy, cut	12382802	1
Caelo	Wild pansy, cut	12189204-3463312101	1
Caelo	Wild pansy, cut	12382806	1
Caelo	Wild pansy, cut	12189204	5
Caelo	Wild pansy, cut	7101303	1
Caelo	Wild pansy, cut	1289203	1
Caelo	Wild pansy, cut	17101205	1
Caelo	Wild pansy, cut	12189203	6
Caelo	Wild pansy, cut	11216103	2
Caelo	Wild pansy, cut	10291009	4
Caelo	Wild pansy, cut	15021301	1
Caelo	Wild pansy, cut	10291007	1
Caelo	Wild pansy, cut	5021304	1
Caelo	Wild pansy, cut	10291008	1
Caelo	Wild pansy, cut	14061311	1
Caelo	Wild pansy, cut	14312904	1
Caelo	Wild pansy, cut	12189204-3458312120	1
Caelo	Wild pansy, cut	12382805	1
Caelo	Wild thyme, cut	11374805i.O.	1
Caelo	Wild thyme, cut	11374803	2
Caelo	Wild thyme, cut	11374805	5
Caelo	Wild thyme, cut	13086801	1
Caelo	Wild thyme, cut	13086805	3
Caelo	Wild thyme, cut	4501A120813	2

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Supplier	Substance	Batch	Spectra
Caelo	Wild thyme, cut	111374807	1
Caelo	Wild thyme, cut	11031203	1
Caelo	Willow bark, cut	11073208	1
Caelo	Willow bark, cut	11073210	4
Caelo	Willow bark, cut	12185201	6
Caelo	Willow bark, cut	12185202	2
Caelo	Willow bark, cut	12185210	1
Caelo	Willow bark, cut	12185207	3
Caelo	Willow bark, cut	13180701	1
Caelo	Willow bark, cut	13180705	1
Caelo	Willow bark, cut	21011302	1
Caelo	Willow bark, cut	2185206	1
Caelo	Willow bark, cut	12185204	5
Caelo	Willow bark, cut	11073201	1
Caelo	Willow bark, cut	272101	1
Caelo	Willow bark, cut	4312E-01305	1
Caelo	Willow bark, cut	12185206	6
Caelo	Willow bark, cut	12185208	15
Caelo	Willow bark, cut	13180702	4
Caelo	Willow bark, cut	13180705-3530411072	1
Caelo	Willow bark, cut	9071301	1
Caelo	Willow herb, cut	11347318	2
Caelo	Willow herb, cut	11347316	1
Caelo	Willow herb, cut	11347311	1
Caelo	Willow herb, cut	10194216	1
Caelo	Willow herb, cut	13200203	1
Caelo	Willow herb, cut	13104702	1
Caelo	Willowherb, small flo…	13200202-3481312102	1
Caelo	Willowherb, small flo…	12117701-3371319012	1
Caelo	Willowherb, small flo…	21061307	1
Caelo	Willowherb, small flo…	18031305	1
Caelo	Willowherb, small flo…	10326108	15
Caelo	Willowherb, small flo…	29121201	1
Caelo	Willowherb, small flo…	13071301	1
Caelo	Willowherb, small flo…	28031318	1
Caelo	Willowherb, small flo…	2412E-01641	1
Caelo	Willowherb, small flo…	22011304	1
Caelo	Willowherb, small flo…	1031301	1
Caelo	Willowherb, small flo…	12041301	1
Caelo	Willowherb, small flo…	2081305	1
Caelo	Willowherb, small flo…	12064506	1
Caelo	Willowherb, small flo…	613M-01641	1
Caelo	Willowherb, small flo…	7071201	1
Caelo	Willowherb, small flo…	9378908	1
Caelo	Willowherb, small flo…	10326104	5
Caelo	Willowherb, small flo…	10326107	1
Caelo	Willowherb, small flo…	12117701	8
Caelo	Willowherb, small flo…	13200203	9
Caelo	Willowherb, small flo…	13200201	4
Caelo	Willowherb, small flo…	10326109	3
Caelo	Willowherb, small flo…	16081304	1
Caelo	Willowherb, small flo…	16081302	1
Caelo	Willowherb, small flo…	15101302	1
Caelo	Willowherb, small flo…	31101303	1
Caelo	Willowherb, small flo…	412041	1
Caelo	Willowherb, small flo…	15011411	1
Caelo	Willowherb, small flo…	14267909	1
Caelo	Willowherb, small flo…	13355906	2
Caelo	Wormwood herb, cut	7031301	1
Caelo	Wormwood herb, cut	1108508	1

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Supplier	Substance	Batch	Spectra
Caelo	Wormwood herb, cut	11285806	2
Caelo	Wormwood herb, cut	11285802	3
Caelo	Wormwood herb, cut	11285804	1
Caelo	Wormwood herb, cut	11285805	4
Caelo	Wormwood herb, cut	6101203	1
Caelo	Wormwood herb, cut	12355803	36
Caelo	Wormwood herb, cut	12103003	12
Caelo	Wormwood herb, cut	11285809	1
Caelo	Wormwood herb, cut	11285803	3
Caelo	Wormwood herb, cut	12355801	24
Caelo	Wormwood herb, cut	13174403	1
Caelo	Wormwood herb, cut	nachprüfung	1
Caelo	Wormwood herb, cut	277513	2
Caelo	Wormwood herb, cut	272957	3
Caelo	Wormwood herb, cut	2213M-01611	1
Caelo	Wormwood herb, cut	1911E-01611	1
Caelo	Wormwood herb, cut	15408304	1
Caelo	Wormwood herb, cut	13387008	1
Caelo	Wormwood herb, cut	13381905	2
Caelo	Wormwood herb, cut	11285811	4
Caelo	Wormwood herb, cut	13174402	1
Caelo	Wormwood herb, cut	12355808	2
Caelo	Wormwood herb, cut	7011401	1
Caelo	Wormwood herb, cut	12355805	5
Caelo	Wormwood herb, cut	12355804	10
Caelo	Wormwood herb, cut	12355802	4
Caelo	Wormwood herb, cut	13174401	3
Caelo	Wormwood herb, cut	12355807	11
Caelo	Wormwood herb, cut	13381902	4
Caelo	Yarrow flower, rubbed	12363005	6
Caelo	Yarrow flower, rubbed	12267703	3
Caelo	Yarrow flower, rubbed	12363002	6
Caelo	Yarrow flower, rubbed	12363007	1
Caelo	Yarrow flower, rubbed	13350507	1
Caelo	Yarrow flower, rubbed	70139427	1
Caelo	Yarrow flower, rubbed	12338306	1
Caelo	Yarrow herb, cut	12338306-3358319071	1
Caelo	Yarrow herb, cut	12338311	3
Caelo	Yarrow herb, cut	13029107-3418310182	1
Caelo	Yarrow herb, cut	13029107-3436311151	1
Caelo	Yarrow herb, cut	12338303	10
Caelo	Yarrow herb, cut	12338305	12
Caelo	Yarrow herb, cut	2311E-01665	1
Caelo	Yarrow herb, cut	16102013E	1
Caelo	Yarrow herb, cut	16041302	1
Caelo	Yarrow herb, cut	15006720	1
Caelo	Yarrow herb, cut	15006713	1
Caelo	Yarrow herb, cut	15006708	1
Caelo	Yarrow herb, cut	1408510	1
Caelo	Yarrow herb, cut	14018516	1
Caelo	Yarrow herb, cut	14018508	1
Caelo	Yarrow herb, cut	11306304	1
Caelo	Yarrow herb, cut	13381810	1
Caelo	Yarrow herb, cut	13381806	3
Caelo	Yarrow herb, cut	12041302	1
Caelo	Yarrow herb, cut	13381805	1
Caelo	Yarrow herb, cut	27011404	1
Caelo	Yarrow herb, cut	13381804	3
Caelo	Yarrow herb, cut	1309106	1
Caelo	Yarrow herb, cut	130291103	1

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Supplier	Substance	Batch	Spectra
Caelo	Yarrow herb, cut	13029108	9
Caelo	Yarrow herb, cut	13029107	2
Caelo	Yarrow herb, cut	13029106	12
Caelo	Yarrow herb, cut	13029105	4
Caelo	Yarrow herb, cut	13029104	5
Caelo	Yarrow herb, cut	12379607	1
Caelo	Yarrow herb, cut	12379606	12
Caelo	Yarrow herb, cut	12336306	1
Caelo	Yarrow herb, cut	12379603	7
Caelo	Yarrow herb, cut	12379601	11
Caelo	Yarrow herb, cut	12338306	5
Caelo	Yarrow herb, cut	130929105	1
Caelo	Yarrow herb, cut	11306303	2
Caelo	Yarrow herb, cut	14018503	2
Caelo	Yarrow herb, cut	11280517	2
Caelo	Yarrow herb, cut	12338304	19
Caelo	Yarrow herb, cut	12379602	19
Caelo	Yarrow herb, cut	11218404	2
Caelo	Yarrow herb, cut	11280503	1
Caelo	Yarrow herb, cut	11306301	1
Caelo	Yarrow herb, cut	8011421	1
Caelo	Yarrow herb, cut	9101311	1
Caelo	Yarrow herb, cut	9121304	1
Caelo	Yarrow herb, cut	10081301	1
Caelo	Yarrow herb, cut	10101205	1
Caelo	Yarrow herb, cut	5021302	1
Caelo	Yarrow herb, cut		3
Caelo	Yarrow herb, cut	11280512	10
Caelo	Yarrow herb, cut	3955/V08/14	1
Caelo	Yarrow herb, cut	3313Q-01665	1
Caelo	Yarrow herb, cut	31121207	1
Caelo	Yarrow herb, cut	29071301	1
Caelo	Yarrow herb, cut	11280511	6
Caelo	Yarrow herb, cut	H-220313-1	1
Caelo	Yellow chaste weed, cut	12170605	2
Caelo	Yellow chaste weed, cut	12170603	1
Caelo	Yellow chaste weed, cut	1024407	1
Caelo	Yellow chaste weed, cut	10244407	1
Caelo	Yellow chaste weed, cut	10244408	1
Caelo	Yellow chaste weed, cut	15029505	1
Caelo	Yellow chaste weed, cut	11293101	5
Caelo	Yellow chaste weed, cut	12170602	2
Caelo	Yellow chaste weed, cut	512U-01473	1
Caelo	Zedoary root, cut	13010106	4
Caelo	Zedoary root, cut	11091607	1
Caelo	Zedoary root, cut	11091603	1
Caelo	Zedoary root, cut	12125304	2
Caelo	Zedoary root, cut	12125303	1
Caelo	Zedoary root, cut	111091607	1
Caelo	Zedoary root, cut	13010102	6
Caelo	Zedoary root, cut	25111304	1
Caelo	Zedoary root, cut	11091604	1
Caelo	Zedoary root, cut	nachprüfung	1
Caelo	Zedoary root, powdered	13165501	2
Caelo	Zedoary root, powdered	13165504	4
Caelo	Zedoary root, powdered	15277101	1
Caelo	Zedoary root, powdered	12007504	1
Caelo	Zedoary root, powdered	12344605	1
Caelo	Zinc sulfate heptahyd…	12257818	1
Caelo	Zinc sulfate heptahyd…	12257809	4

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Supplier	Substance	Batch	Spectra
Caelo	Zinc sulfate heptahyd…	110500201	1
Caelo	Zinc sulfate heptahyd…	12257816	1
Caelo	Zinc sulfate heptahyd…	11095601	1
Caelo	Zinc sulfate heptahyd…	12257802	1
Caelo	Zinc sulfate heptahyd…	CH:001/0913	1
Caelo	Zinc sulfate heptahyd…	4012Q-02798	1
Caelo	Zinc sulfate heptahyd…	81554199	1
Caelo	Zinc sulfate heptahyd…	11095621	1
Caesar & Lorenz	Caraway fruit	12226609	5
Caesar & Lorenz	Yarrow herb, cut	12379605	5
Caesar & Loretz	Kaolin, heavy	13041801	4
Caesar & Loretz GmbH	Hawthorn flower	11068206	5
Caesar & Loretz GmbH	Magnesium chloride he…	13064223	1
Caesar & Loretz GmbH	Morphine hydrochloride	15199712	1
Caesar & Loretz GmbH	Morphine hydrochloride	15199711	1
Caesar & Loretz GmbH	Morphine hydrochloride	15199711(2)	1
Caesar & Loretz GmbH	Morphine hydrochloride	15199711(1)	1
Caesar & Loretz GmbH	Thiomersal	12275218	1
Caesar & Loretz GmbH …	Bitter fennel	11016319	4
Caesar & Loretz GmbH …	Black mustard seed, p…	11276701	3
Caesar & Loretz GmbH …	Liqourice root, peeled	11034014	4
Caesar & Loretz GmbH …	Mallow flower, cut	10357901	2
Caesar & Loretz GmbH …	Nettle leaf, cut	10291405	3
Caesar & Loretz GmbH …	Raspberry leaf, cut	10013408	3
Caesar & Loretz GmbH …	Ribwort plantain, cut	10315707	5
Caesar & Loretz GmbH …	Sage leaf, cut	11056109	8
Caesar & Loretz GmbH …	Senna leaf, cut	11277303	6
Caesar & Loretz GmbH …	Senna leaf, cut	11041012	1
Caesar & Loretz GmbH …	Senna pods, tinnevelly	11003003	1
Caesar & Loretz GmbH …	Potassium hydroxide	12057902	2
Caesar & Loretz GmbH …	Sage leaf, cut	11056121	4
Caesar & Loretz GmbH …	Black cumin seed	LMV1505024	1
Caesar & Loretz GmbH,…	Aluminium chloride he…	12047508	5
Caesar & Loretz GmbH,…	Aniseed	12226402	5
Caesar & Loretz GmbH,…	Bitter fennel	12094707	8
Caesar & Loretz GmbH,…	Bitter fennel	12094711	3
Caesar & Loretz GmbH,…	Bitter fennel	12094705	3
Caesar & Loretz GmbH,…	Bitter fennel	12094705	5
Caesar & Loretz GmbH,…	Caraway fruit	11003213	2
Caesar & Loretz GmbH,…	Caraway fruit	9267824	2
Caesar & Loretz GmbH,…	Equisetum stem, cut	11207010	1
Caesar & Loretz GmbH,…	Gentian root, cut	12244603	2
Caesar & Loretz GmbH,…	Maté leaf, cut	13118002	10
Caesar & Loretz GmbH,…	Nettle leaf, cut	10291423	9
Caesar & Loretz GmbH,…	Sage leaf, cut	12370016	8
Caesar & Loretz GmbH,…	Sage leaf, cut	12370010	18
Caesar & Loretz GmbH,…	Sage leaf, cut	12370002	4
Caesar & Loretz GmbH,…	Sage leaf, cut	11347502	6
Caesar & Loretz GmbH,…	Senna leaf, cut	13136708	7
Caesar & Loretz GmbH,…	Senna leaf, cut	12273103	15
Caesar & Loretz GmbH,…	Senna leaf, cut	11277314	5
Caesar & Loretz GmbH,…	Senna leaf, cut	11277308	3
Caesar & Loretz GmbH,…	Senna pods, tinnevelly	12267601	2
Caesar & Loretz GmbH,…	Senna pods, tinnevelly	12267603	1
Caesar & Loretz GmbH,…	Senna pods, tinnevelly	11003014	1
Caesar & Loretz GmbH,…	Senna pods, tinnevelly	11003012	1
Caesar & Loretz GmbH,…	Sodium hydrogen carbo…	13060102	4
Caesar & Loretz GmbH,…	Tall golden rod, cut	11207014	3
Caesar & Loretz GmbH,…	Wild thyme, cut	11374802	1
Caesar & Loretz/ Noweda	Heavy alkaline bismut…	12145701	1

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Supplier	Substance	Batch	Spectra
Caesar & Loretz/ Noweda	Hyssop herb, cut	11374301	1
Caesar & Loretz/ Noweda	Ivy leaf, cut	12225606	5
Caesar & Loretz/Noweda	Aniseed	153986002	1
Caesar & Loretz/Noweda	Caraway fruit	15056601	1
Caesar&Loretz GmbH D-...	Senna leaf, cut	12115504	5
Caesar&loretz,AHC	Nystatin	14196509	2
Caesar&loretz,Anzag	Nystatin	12158008	10
Caesar&loretz,Phoenix	Frangula bark, cut	14163104	1
Caesar&loretz,Phoenix	Ladys bedstraw herb,...	14019215	1
Caesar&loretz,Phoenix	Ladys bedstraw herb,...	14019206	1
Caesar&loretz,Phoenix	Marjoram herb, rubbed	14181005	1
Caesar&loretz,Phoenix	Metoclopramide hydroc...	14193101	2
Caesar&loretz,Phoenix	Nystatin	13173408	2
Caesar&loretz,Phoenix	Nystatin	1218008	1
Caesar&loretz,Phoenix	Nystatin	1111057-01	13
Caesar&loretz,Phoenix	Nystatin	14363512	2
caesar&loretz,Phönix	Iceland moss, cut	14304404	2
Caesar/ Noweda	Black mustard seed, p...	14293711	3
Caesar/Lorenz	Matricaria flower	12337610	2
Caesar/Noweda	Aloes, cape, cut	12338211	1
Caesar/Noweda	Aloes, cape, cut	2013E-01089	1
Caesar/Noweda	Aluminium potassium s...	12184411	2
Caesar/Noweda	American liverwort, cut	11254608	1
Caesar/Noweda	Bogbean leaf, cut	1510U-01517	1
Caesar/Noweda	Coriander	2010M-01539	1
Caesar/Noweda	Couch grass rhizome, ...	12186813	6
Caesar/Noweda	Elder flower, rubbed	4910A-01471	1
Caesar/Noweda	Heather, cut	4911I-03224	1
Caesar/Noweda	Ispaghula seed	12276516	1
Caesar/Noweda	Ispaghula seed	12276503	1
Caesar/Noweda	Ispaghula seed	12276509	3
Caesar/Noweda	Lycopodium herb, cut	1255008	1
Caesar/Noweda	Mullein flower, cut	2810E-01475	1
Caesar/Noweda	Psyllium seed	12276501	3
Caesar/Noweda	Psyllium seed	11185817	3
Caesar/Noweda	Restharrow root, cut	71015/3	2
Caesar/Noweda	Theriac, powdered	12289309	1
caeser&loretz, 09.11....	Podophyllum resin (fr...	11085813	1
Caleo/ Anzag	Wormwood herb, cut	11285810	7
calo	Lycopodium herb, cut	11255006	1
carotech	Tocomax 20%	A3_200003_1/5	1
Cealo	Ispaghula seed	12276502	5
Cealo	Magnesium chloride he...	11354615	1
Cealo	Magnesium chloride he...	112354615	1
Cealo	Ribwort plantain, cut	12362907	5
celo	Ladys bedstraw herb,...	nachprüfung	1
celo	Tall nasturtium herb,...	nachprüfung	1
celo	Yarrow herb, cut	nachprüfung	1
Celo	Agrimony, cut	11374003	1
Changsha staherb natu...	Amygdalin	STA-13032202	1
Chiesi/Phönix	Black cumin seed	14359906	3
China Medica	Raspberry leaf, cut	13086703	1
china medica 14.06.2013	Angelica root	98019	1
china medica 14.06.2013	Cinnamon rods (Ceylon...	210810	1
china medica 14.06.2013	Cinnamon, cut	210842	1
china medica 14.06.2013	Lemon peel, cut	101201H045	1
china medica 14.06.2013	Rhubarb, cut	20072	1
china medica 14.06.2013	Water plantain rhizom...	30065	1
Clariant - Mindel-Food	Bentonite	1301	1
Creapure	Creatine	515941	1

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Supplier	Substance	Batch	Spectra
Defektur	Bitter fennel	57/13	1
Defektur	Bitter fennel	52/13	1
Defektur	Bitter fennel	7/13	1
Defektur	Bitter fennel	26813035/12	1
Defektur	Matricaria flower	29/13	1
Defektur	Matricaria flower	10/13	1
Defektur	Matricaria flower	59/13	1
Defektur	Matricaria flower	56/12	1
Degussa / falcento	Creatine	422031	1
Denk	D-(+)-mannose	R-4680	1
Dermapharm	8-quinolinol sulfate ...	140804	1
Dermapharm	8-quinolinol sulfate ...	120905	1
Dermapharm	8-quinolinol sulfate ...	100804	1
Dr. Behr	Dimercaptosuccinic acid	WE14020002	1
Dr. Behr GmbH	Dimercaptosuccinic acid	WE14070074(003)/14G	1
Dr.Behr GmbH	Dimercaptosuccinic acid	WE15060032/D1/150500	1
ebert u.jacobi	Marian thistle fruit	287527	1
Ebert-Jacobi	Methadone hydrochloride	16135306	1
Erfurter Ölmühle	Linseed		1
Erika apotheke	Fumitory, cut	11101412	1
Erika apotheke	Marian thistle fruit	11126704	3
Erika apotheke	Nettle leaf, cut	12184003	24
Erika apotheke	Nettle leaf, cut	12195001	11
Eu Rho	Sodium hydrogen carbo...	1203030-01	13
EuRho	Aluminium chloride he...	d024a	1
EuRho	Aluminium chloride he...	2512I01095	1
EuRho	Aluminium chloride he...	1106017-01	2
EuRho	Dithranol	1203025-01	1
EuRho	Magnesium sulfate hep...	3512M-01835	1
EuRho	Sodium sulfate decahy...	1210005-01	3
EuRho	Tricalcium phosphate	13031203	1
Eurho/Noweda	Black mustard seed, p...	13356304	1
Eurho/Phoenix	Midazolam hydrochloride	12L17-N10	1
euro	Sodium hydrogen carbo...	110902901	1
Euro / Jenne	Magnesium sulfate hep...	1401029-01	2
Euro OTC	Aluminium chloride he...	1109025-01	8
Euro OTC	Aluminium chloride he...	121001401	4
Euro OTC	Aluminium chloride he...	120402602	2
Euro OTC	Aluminium chloride he...	2111Q-01095	1
Euro OTC	Aluminium chloride he...	1106017-02	3
Euro OTC	Aluminium chloride he...	1507002-01	1
Euro OTC	Aluminium chloride he...	1210012-01	1
Euro OTC	Aluminium chloride he...	1103007-01	2
Euro OTC	Aluminium chloride he...	1213M-01095	1
Euro OTC	Aluminium chloride he...	120402601	4
Euro OTC	Aluminium chloride he...	1109025-02	6
Euro OTC	Aluminium chloride he...	1204026-02	20
Euro OTC	Aluminium chloride he...	1210014-02-336331909	1
Euro OTC	Aluminium chloride he...	1307011	1
Euro OTC	Aluminium chloride he...	1307011-01	11
Euro OTC	Aluminium chloride he...	co31a	1
Euro OTC	Aluminium chloride he...	1307011-02	2
Euro OTC	Aluminium potassium s...	1004046-02	1
Euro OTC	Ammonium chloride	1203029-01	3
Euro OTC	Ammonium chloride	512A-01104	1
Euro OTC	Ammonium chloride	1212017-01	2
Euro OTC	Ammonium chloride	1303029-01	1
Euro OTC	Amygdalin	NF-A20130203	1
Euro OTC	Bentonite	1304026-01	1
Euro OTC	Betaine hydrochloride	L1510011-03	2

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Supplier	Substance	Batch	Spectra
Euro OTC	Betaine hydrochloride	1510011-02	1
Euro OTC	Betaine hydrochloride	L1412019-01	1
Euro OTC	Betaine hydrochloride	1202008-01	1
Euro OTC	Betaine hydrochloride	1305027-01	2
Euro OTC	Centaury, cut	272897	3
Euro OTC	Chromium yeast 0.2%	L1311026-01	1
Euro OTC	Chromium yeast 0.2%	L1406030-01	1
Euro OTC	Chromium yeast 0.2%	L1507039-01	1
Euro OTC	Chromium yeast 0.2%	1303028-01	1
Euro OTC	Chromium yeast 0.2%	1406030-01	1
Euro OTC	Chromium yeast 0.2%	L1502003-01	1
Euro OTC	Copper orotate dihydr...	1206035-01	2
Euro OTC	Copper orotate dihydr...	2106001Z-01	1
Euro OTC	Curcuma extract 95%	L1107001	1
Euro OTC	D-(+)-mannose	L1111005-01	2
Euro OTC	Dandelion herb with r...	11030312	6
Euro OTC	Deoxycholic acid	1305051-01	1
Euro OTC	Dithranol	DT/370/2012	1
Euro OTC	Dithranol	B:1008011-01	1
Euro OTC	Dithranol	56/11072013	1
Euro OTC	Dithranol	1008011-02	4
Euro OTC	Dithranol	1008011-01	1
Euro OTC	Dithranol	2902060-02	1
Euro OTC	Dithranol	20280812-1	1
Euro OTC	Dithranol	1311029-01	2
Euro OTC	Dithranol	1203025-02	20
Euro OTC	Equisetum stem, cut	3831A130610	6
Euro OTC	Frankincense	10349212	2
Euro OTC	Frankincense extract ...	1112016-01	1
Euro OTC	Frankincense extract ...	1104005V-04	3
Euro OTC	Frankincense extract ...	1104005-01	1
Euro OTC	Griffonia seed extract	1205027	1
Euro OTC	Hamamelis leaf, cut	12164805	4
Euro OTC	Heavy magnesium oxide	1012033-01	1
Euro OTC	Heavy magnesium oxide	1205012-01	2
Euro OTC	Heavy magnesium oxide	1111006-01	1
Euro OTC	Heavy, basic magnesiu...	1205013-02	1
Euro OTC	Heavy, basic magnesiu...	1211005-01	4
Euro OTC	Heavy, basic magnesiu...	1305024-01	1
Euro OTC	Hyssop herb, cut	nachprüfung	1
Euro OTC	Magnesium chloride he...	1112013-01	2
Euro OTC	Magnesium chloride he...	1204017-01	2
Euro OTC	Magnesium chloride he...	1212013-01	4
Euro OTC	Magnesium sulfate hep...	1211022-01	7
Euro OTC	Magnesium sulfate hep...	1206019-01	7
Euro OTC	Magnesium sulfate hep...	1109023-01	2
Euro OTC	Magnesium sulfate hep...	130300801	2
Euro OTC	Magnesium sulfate hep...	170610	1
Euro OTC	Magnesium sulfate hep...	1306015-01	1
Euro OTC	Magnesium sulfate hep...	1202017-01	6
Euro OTC	Marian thistle herb, ...	3701A-111207	1
Euro OTC	Matricaria flower	12361702	7
Euro OTC	Methadone hydrochloride	14C24-B01	2
Euro OTC	Nettle seed	12131507	2
Euro OTC	Nystatin	121202401	1
Euro OTC	Nystatin	B:1107046-01	1
Euro OTC	Nystatin	110704601	1
Euro OTC	Nystatin	111105701	1
Euro OTC	Nystatin	1107046-01	9
Euro OTC	Nystatin	1511020-02	1

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Supplier	Substance	Batch	Spectra
Euro OTC	Nystatin	1207009-02	5
Euro OTC	Nystatin	130705301	1
Euro OTC	Nystatin	1105032-01	1
Euro OTC	Nystatin	1307053-02	3
Euro OTC	Nystatin	C129854	1
Euro OTC	Nystatin	C129531	2
Euro OTC	Nystatin	1212024-01	22
Euro OTC	Nystatin	1511020-01	1
Euro OTC	Nystatin	19500711	1
Euro OTC	Nystatin	2811032-01	1
Euro OTC	Nystatin	C129440	1
Euro OTC	Nystatin	121024-01	1
Euro OTC	Nystatin	4014991	2
Euro OTC	Nystatin	1307053-01	8
Euro OTC	Nystatin	127009-02	1
Euro OTC	Nystatin	1212024-02	19
Euro OTC	Oak bark, cut		1
Euro OTC	Potassium hydrocarbon...	1208010-01	4
Euro OTC	Potassium hydrocarbon...	1204038-01	2
Euro OTC	Potassium hydrocarbon...	70913Kahyca	1
Euro OTC	Potassium hydrocarbon...	1202013-01	1
Euro OTC	Potassium hydrocarbon...	2809033-01	1
Euro OTC	Potassium hydrocarbon...	2712008-01	1
Euro OTC	Potassium hydrocarbon...	4413I1728	1
Euro OTC	Potassium orotate	1203038-01	1
Euro OTC	Sodium alginate	1509036-01	1
Euro OTC	Sodium dihydrogen pho...	1305028-01	1
Euro OTC	Sodium dihydrogen pho...	1209004-01	2
Euro OTC	Sodium hydrogen carbo...	1109029-01	11
Euro OTC	Sodium hydrogen carbo...	1104013-01	4
Euro OTC	Sodium hydrogen carbo...	1304017-01	6
Euro OTC	Sodium hydrogen carbo...	120303001	1
Euro OTC	Sodium hydrogen carbo...	1012011-01	2
Euro OTC	Sodium hydrogen carbo...	1203030-02	9
Euro OTC	Sodium hydrogen carbo...	1304017-02	2
Euro OTC	Sodium hydrogen carbo...	120800801	2
Euro OTC	Sodium hydrogen carbo...	1012011	1
Euro OTC	Sodium molybdate dihy...	180910	1
Euro OTC	Sodium molybdate dihy...	L1305049-01	2
Euro OTC	Sodium molybdate dihy...	L1204020-01	1
Euro OTC	Sodium sulfate decahy...	4312I-01920	1
Euro OTC	Sodium sulfate decahy...	1108035-02	4
Euro OTC	Sodium sulfate decahy...	121000502	2
Euro OTC	Sodium sulfate decahy...	1108035-01	3
Euro OTC	Talcum	1305022-02	2
Euro OTC	Talcum	1411014-01	1
Euro OTC	Talcum	1210052-01	5
Euro OTC	Talcum	1305022-01	9
Euro OTC	Tocomax 20%	100912	1
Euro OTC	Tragacanth, powdered	12285401	1
Euro OTC	Tricalcium phosphate	1304025-01	2
Euro OTC	Tricalcium phosphate	1206002-01	4
Euro OTC	Zinc orotate dihydrate	1107029-1	1
Euro OTC	Zinc sulfate heptahyd...	1201031-02	1
Euro OTC	Zinc sulfate heptahyd...	1201031-01	1
Euro OTC	Zinc sulfate heptahyd...	1309011_0	1
Euro OTC	Zinc sulfate heptahyd...	1201031-2	1
Euro OTC	Zinc sulfate heptahyd...	1105002-01	2
EUro/AHD	Calcium chloride dihy...	1205014-02	2
euroho/gehe	Sodium hydrogen carbo...	123030-02	1

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Supplier	Substance	Batch	Spectra
Euroo/Phoenix	Aluminium chloride he…	120014-02	1
Extrakt Chemie	Cowberry extract 6:1	17320/01	1
Faagron	Methadone hydrochloride	1437H011	1
Fagron	8-quinolinol sulfate …	13G10-N06	2
Fagron	8-quinolinol sulfate …	13D24-N11	1
Fagron	8-quinolinol sulfate …	11I09-N09	1
Fagron	8-quinolinol sulfate …	13A04-N05	2
Fagron	8-quinolinol sulfate …	11L08-N08	1
Fagron	8-quinolinol sulfate …	13/21-N23	1
Fagron	8-quinolinol sulfate …	11/09-N09	1
Fagron	8-quinolinol sulfate …	12A04-N05	1
Fagron	8-quinolinol sulfate …	11L19-N14	1
Fagron	8-quinolinol sulfate …	10F01-N15	1
Fagron	8-quinolinol sulfate …	13032014C	1
Fagron	8-quinolinol sulfate …	11L08-N07	2
Fagron	Alchemilla, cut	11182802	1
Fagron	Almonds, bitter, whole	40A121010	11
Fagron	Aluminium chloride he…	12c07n01	1
Fagron	Aluminium chloride he…		3
Fagron	Aluminium chloride he…	1227N01	1
Fagron	Aluminium chloride he…	13D22-09	1
Fagron	Aluminium chloride he…	12G05-N10	31
Fagron	Aluminium chloride he…	5213A1095	1
Fagron	Aluminium chloride he…	C145A	1
Fagron	Aluminium chloride he…	2913U1095	1
Fagron	Aluminium chloride he…	12l27-N01	5
Fagron	Aluminium chloride he…	12L11-N03	3
Fagron	Aluminium chloride he…	2405211095	1
Fagron	Aluminium chloride he…	2013U-01095	1
Fagron	Aluminium chloride he…	C012A	1
Fagron	Aluminium chloride he…	20122013E	1
Fagron	Aluminium chloride he…	1910211095	1
Fagron	Aluminium chloride he…	1901211095	1
Fagron	Aluminium chloride he…	13J31-B06-287615	1
Fagron	Aluminium chloride he…	13I26-N13	2
Fagron	Aluminium chloride he…	8547287	1
Fagron	Aluminium chloride he…	13d22no9	1
Fagron	Aluminium chloride he…	12I-27-N01	1
Fagron	Aluminium chloride he…	12g05-n10	1
Fagron	Aluminium chloride he…	13D22N09	2
Fagron	Aluminium chloride he…	12i27-N01	2
Fagron	Aluminium chloride he…	12I27-N01	12
Fagron	Aluminium chloride he…	12082013D	1
Fagron	Aluminium chloride he…	C181A	3
Fagron	Aluminium chloride he…	12323702	18
Fagron	Aluminium chloride he…	12G05-N0	1
Fagron	Aluminium chloride he…	13D22.-N09	1
Fagron	Aluminium chloride he…	105282-0001	1
Fagron	Aluminium chloride he…	105282-0002	1
Fagron	Aluminium chloride he…	11/23-N06B206A	1
Fagron	Aluminium chloride he…	11|23-N06	1
Fagron	Aluminium chloride he…	11C07_N05	1
Fagron	Aluminium chloride he…	11D04-N10	1
Fagron	Aluminium chloride he…	11G05-N02	4
Fagron	Aluminium chloride he…	11G05-No2	1
Fagron	Aluminium chloride he…	13126-N13	1
Fagron	Aluminium chloride he…	11GO5-N02	1
Fagron	Aluminium chloride he…	11l23-N06	3
Fagron	Aluminium chloride he…	12/11-No3	1
Fagron	Aluminium chloride he…	12/27/N01	1

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Supplier	Substance	Batch	Spectra
Fagron	Aluminium chloride he…	12047512	5
Fagron	Aluminium chloride he…	1207211095	1
Fagron	Aluminium potassium s…	12I24-M03	1
Fagron	Aluminium potassium s…	13D29-N04	1
Fagron	Aluminium potassium s…	11F20-M12	1
Fagron	Aluminium potassium s…	13D08-N01	2
Fagron	Aluminium potassium s…	A1-063-AL	1
Fagron	Aluminium potassium s…	103638	1
Fagron	Aluminium potassium s…	A1-063-Al	1
Fagron	Aluminium potassium s…	12/24-M02	1
Fagron	Amphetamine sulfate	78012	1
Fagron	Amphetamine sulfate	88689	2
Fagron	Amphetamine sulfate	96200	1
Fagron	Amphetamine sulfate	15l01-b05-315292	1
Fagron	Amphetamine sulfate	12/24N-03	1
Fagron	Amphetamine sulfate	11/01-N01	1
Fagron	Amphetamine sulfate	11D04-N13	1
Fagron	Amphetamine sulfate	324577	2
Fagron	Amphetamine sulfate	12B06-N13	3
Fagron	Amphetamine sulfate	12E11-N06	5
Fagron	Amphetamine sulfate	CH13B11-N04	1
Fagron	Amphetamine sulfate	2213Q-03361	1
Fagron	Amphetamine sulfate	315291	1
Fagron	Amphetamine sulfate	14E19-B09-304502	2
Fagron	Amphetamine sulfate	16A29-B03	6
Fagron	Amphetamine sulfate	11E23-N04	1
Fagron	Amphetamine sulfate	13/18-B40-290538	1
Fagron	Amphetamine sulfate	16A29-B03-318743	1
Fagron	Amphetamine sulfate	13D09-N03	1
Fagron	Amphetamine sulfate	13J18-B40	1
Fagron	Amphetamine sulfate	13B11-N04	6
Fagron	Amphetamine sulfate	14E19-B09	2
Fagron	Amphetamine sulfate	14E19-B09-294572	2
Fagron	Amphetamine sulfate	14E19-B09-294573	1
Fagron	Amphetamine sulfate	14E19-B09-304501	1
Fagron	Amphetamine sulfate	13J18B40	1
Fagron	Amphetamine sulfate	13J18-B40-290538	2
Fagron	Aniseed	13037801	2
Fagron	Barbital sodium	15L07-B02	1
Fagron	Betaine hydrochloride	13G29-B02-294870	1
Fagron	Betaine hydrochloride	13H13-NO2	1
Fagron	Betaine hydrochloride	15121401	1
Fagron	Betaine hydrochloride	12C20-N09	1
Fagron	Betaine hydrochloride	24091301	1
Fagron	Betamethasone-17-vale…	12G02-N15	3
Fagron	Betamethasone-17-vale…	12J19-N06	1
Fagron	Betamethasone-17-vale…	13E08-N01	1
Fagron	Betamethasone-17-vale…	12L19-N06	4
Fagron	Birch leaf, cut	7061301	1
Fagron	Bitter fennel	12094708	3
Fagron	Bitter fennel		1
Fagron	Bitter fennel	1406211545	1
Fagron	Bitter fennel	6858913	1
Fagron	Black mustard seed, p…	14293705	1
Fagron	Bogbean leaf, cut	2371B100616	1
Fagron	Caffeine citrate	2813E1282	1
Fagron	Caffeine citrate	3914U-01282	1
Fagron	Caffeine citrate	3314E-01282	1
Fagron	Caffeine citrate	26021401	1
Fagron	Caffeine citrate	15a05-b03-318006	1

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Supplier	Substance	Batch	Spectra
Fagron	Caffeine citrate	15A05-B03-318006	10
Fagron	Caffeine citrate	15A05-B03-307135	1
Fagron	Caffeine citrate	15A05-B03302747	1
Fagron	Caffeine citrate	4213U01282	1
Fagron	Caffeine citrate	15a05-b03-302746	1
Fagron	Caffeine citrate	15A05-B03	4
Fagron	Caffeine citrate	15A05-B03	1
Fagron	Caffeine citrate	13D30-N02	1
Fagron	Caffeine citrate	13D30-N02	10
Fagron	Caffeine citrate	11C29-N04	1
Fagron	Caffeine citrate	11082015A	1
Fagron	Caffeine citrate	5013U01282	1
Fagron	Caffeine citrate	15A05B03	1
Fagron	Caffeine citrate	CCC1205	1
Fagron	Caffeine citrate	2714E-01282	1
Fagron	Caffeine citrate	11C29-N04	1
Fagron	Caffeine citrate	2002311282	1
Fagron	Caffeine citrate	13D30-No2	1
Fagron	Caffeine citrate	3513I-01282	1
Fagron	Caffeine citrate	CCD-1401	3
Fagron	Caffeine citrate	204311282	1
Fagron	Caffeine citrate	10H02-N02	2
Fagron	Caffeine citrate	11/12-N13	1
Fagron	Caffeine citrate	12C16-N03	2
Fagron	Caffeine citrate	12J05-N06	1
Fagron	Calcium hydroxide	12J18-N01	1
Fagron	Calcium hydroxide	13D26-N14	1
Fagron	Calcium hydroxide	12G04-N22	1
Fagron	Calendula flower, cut	1241B120312	3
Fagron	Calendula flower, cut	1104211448	1
Fagron	Cinchocaine hydrochlo…	12F25-N10	1
Fagron	Cinnarizine	13I26-N22	1
Fagron	Cinnarizine	14D09-B01	3
Fagron	Cinnarizine	8D11-N04	1
Fagron	Cinnarizine	13H01-N07	4
Fagron	Cinnarizine	14D09-B01-294702	2
Fagron	Cinnarizine	13I26-N22	1
Fagron	Cinnarizine	14D09-B01-292883	1
Fagron	Clobetasol-17-propion…	13W16-N01	1
Fagron	Clobetasol-17-propion…	12L19-N06	1
Fagron	Clobetasol-17-propion…	12I19-N01	1
Fagron	Clobetasol-17-propion…	12K08-N02	2
Fagron	Clobetasol-17-propion…	12A03-N03	2
Fagron	Clobetasol-17-propion…	12/19-N01003637	1
Fagron	Clobetasol-17-propion…	12|19-N01	1
Fagron	Clobetasol-17-propion…	12/19-No1	1
Fagron	Clobetasol-17-propion…	12I19-N01	1
Fagron	Cocaine hydrochloride	15E12-B03	1
Fagron	Cocaine hydrochloride	14H27-B03	1
Fagron	Cocaine hydrochloride	16B11-B05-323385	1
Fagron	Cocaine hydrochloride	12G23-N13	1
Fagron	Codeine phosphate hem…	11L20-N04	1
Fagron	Codeine phosphate hem…	13C11-N10	1
Fagron	Codeine phosphate hem…	13/27-N06	2
Fagron	Codeine phosphate hem…	13I27-N06	2
Fagron	Codeine phosphate hem…	913I-01279	1
Fagron	Codeine phosphate hem…	13E21-N04	1
Fagron	Codeine phosphate hem…	15F09-B02-310520	2
Fagron	Codeine phosphate hem…	15B17-B99-304623	1
Fagron	Codeine phosphate hem…	16E17-B05-324109	4

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Supplier	Substance	Batch	Spectra
Fagron	Codeine phosphate hem…	11/19-N10	1
Fagron	Codeine phosphate hem…	12C05-N01	1
Fagron	Codeine phosphate hem…	1615I-01279	1
Fagron	Copper (II) sulfate p…	13A25-N06	2
Fagron	Deoxycholic acid	13J21-N14	1
Fagron	Deoxycholic acid	12L14-N07	1
Fagron	Dexamethasone 1:10 (r…	12K06-N09	1
Fagron	Dexamethasone 1:10 (r…	12C20-N03	4
Fagron	Dexamethasone 1:10 (r…	12L19-N06	1
Fagron	Dexamphetamine sulfate	13I23-N01	1
Fagron	Dexamphetamine sulfate	12J15-N07	1
Fagron	Dexamphetamine sulfate	11F29-N01	1
Fagron	Dexamphetamine sulfate	15H06-B04-313861	1
Fagron	Dihydrocodeine hydrog…	13H19-N08	3
Fagron	Dihydrocodeine hydrog…	14K26-B04-310974	1
Fagron	Dihydrocodeine hydrog…	12G05-N01	1
Fagron	Dihydrocodeine hydrog…	14D08-B06	1
Fagron	Dihydrocodeine hydrog…	14K26-B04	1
Fagron	Dithranol	APDT/375/2012D	17
Fagron	Dithranol	Ch13A30-N01	1
Fagron	Dithranol	13A30-N01	4
Fagron	Dithranol	17710I-01274	1
Fagron	Dithranol	11L20-N13	1
Fagron	Fentanyl citrate	20100911-1	1
Fagron	Fentanyl citrate	12G02-N03	1
Fagron	Fentanyl citrate	10H20-N02	1
Fagron	Fenugreek, powdered	12149603	1
Fagron	Frankincense		1
Fagron	Fuchsine	12G18-N01	1
Fagron	Fuchsine	12F28-N02	1
Fagron	Fuchsine	13H23-M04	2
Fagron	Fuchsine	12A03-N06	2
Fagron	Fuchsine	13A30-N05	2
Fagron	Heavy alkaline bismut…	1001311186	1
Fagron	Heavy alkaline bismut…	11/13-N01	2
Fagron	Heavy alkaline bismut…	12d26-no3	1
Fagron	Heavy alkaline bismut…	12D26-N03	1
Fagron	Heavy alkaline bismut…	42000079	1
Fagron	Heavy alkaline bismut…	13H28-B04-291385	1
Fagron	Heavy alkaline bismut…	11D28-N16	1
Fagron	Heavy alkaline bismut…	13B25-N02	4
Fagron	Heavy alkaline bismut…	1309211186	1
Fagron	Heavy alkaline bismut…	13C15-N05	3
Fagron	Heavy, basic magnesiu…	13A10-N02	1
Fagron	Heavy, basic magnesiu…	12F20-N04	1
Fagron	Hydromorphone hydroch…	12G05-N02	1
Fagron	Indigo carmine	13K12-N01	1
Fagron	Indigo carmine	12K06-N11	1
Fagron	Indigo carmine	5132316	1
Fagron	Indigo carmine	11F09-N06	1
Fagron	Indigo carmine	12A20-N067-16	1
Fagron	Indigo carmine	5093143	1
Fagron	Ladys bedstraw herb,…	12369004	2
Fagron	Lungwort herb, cut	Nachprüfung	1
Fagron	Macrogols 6000 powder	14J17-B01	1
Fagron	Macrogols 6000 powder	11G14-N03	1
Fagron	Macrogols 6000 powder	12J22-N02	1
Fagron	Magnesium chloride he…	12h21-N02	1
Fagron	Magnesium chloride he…	12H21-N02	13
Fagron	Magnesium chloride he…	12B16-N01	7

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Supplier	Substance	Batch	Spectra
Fagron	Magnesium chloride he…	12H21-NO2	1
Fagron	Magnesium chloride he…	M1430	1
Fagron	Magnesium chloride he…	11K17-N10	3
Fagron	Magnesium chloride he…	12H21-No2	1
Fagron	Magnesium chloride he…	11K17-N01	1
Fagron	Magnesium chloride he…	1304C003-281209	1
Fagron	Magnesium chloride he…	1301C009-277802	4
Fagron	Magnesium chloride he…	M1555	1
Fagron	Magnesium chloride he…	29011304	1
Fagron	Magnesium chloride he…	26061305	1
Fagron	Magnesium chloride he…	13B14-B01-287292	1
Fagron	Magnesium chloride he…	13411207	1
Fagron	Magnesium chloride he…	1304C004-281210	1
Fagron	Magnesium chloride he…	1301c009-277802	1
Fagron	Magnesium chloride he…	12D11-N01	5
Fagron	Magnesium chloride he…	1304c004-281210	1
Fagron	Magnesium chloride he…	1304C002	1
Fagron	Magnesium chloride he…	1304C001-281211	2
Fagron	Magnesium chloride he…	1301C10-277801	2
Fagron	Magnesium chloride he…	1301C10	4
Fagron	Magnesium chloride he…	1301C012-277804	1
Fagron	Magnesium chloride he…	1301C012	1
Fagron	Magnesium chloride he…	1301C011-277803	1
Fagron	Magnesium chloride he…	M1625	2
Fagron	Magnesium chloride he…	1304C003	1
Fagron	Magnesium chloride he…	12D11-NO1	1
Fagron	Magnesium sulfate hep…	12G24-N02	1
Fagron	Magnesium sulfate hep…	12L10-NO7	1
Fagron	Magnesium sulfate hep…	13H05-N02	1
Fagron	Magnesium sulfate hep…	31161	2
Fagron	Marian thistle fruit	10270608	1
Fagron	Matricaria flower		1
Fagron	Melissa leaf, cut	12032318	3
Fagron	Methadone hydrochloride	15I24-B07	1
Fagron	Methadone hydrochloride	14C24-B01-292862	1
Fagron	Methadone hydrochloride	12B21N03	1
Fagron	Methadone hydrochloride	1437H012	3
Fagron	Methadone hydrochloride	12H07-N07	1
Fagron	Methadone hydrochloride	1409H043	1
Fagron	Methadone hydrochloride	13B06-N02	7
Fagron	Methadone hydrochloride	13J24-B06-286908	1
Fagron	Methadone hydrochloride	13J24B06286910	1
Fagron	Methadone hydrochloride	171920-0009	1
Fagron	Methadone hydrochloride	20130912-6	1
Fagron	Methadone hydrochloride	25091307	1
Fagron	Methadone hydrochloride	14H15-B01-299381	1
Fagron	Methadone hydrochloride	13I24-B06-286908	1
Fagron	Methadone hydrochloride	15B24-B02-313097	1
Fagron	Methadone hydrochloride	11D07-N09	1
Fagron	Methadone hydrochloride	1327h051	1
Fagron	Methadone hydrochloride	13J24-B06	1
Fagron	Methadone hydrochloride	13J24-B06-286907	1
Fagron	Methadone hydrochloride	14C24-B01-292857	4
Fagron	Methadone hydrochloride	13F17-N02	6
Fagron	Methadone hydrochloride	1316H037	4
Fagron	Methadone hydrochloride	8081501	1
Fagron	Methadone hydrochloride	4031517	1
Fagron	Methadone hydrochloride	12B21-N03	2
Fagron	Methadone hydrochloride	14H15-B01	1
Fagron	Methadone hydrochloride	14H15-B01-299380	1

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Supplier	Substance	Batch	Spectra
Fagron	Methadone hydrochloride	15E29-B02-313098	3
Fagron	Methadone hydrochloride	1608H002	1
Fagron	Methadone hydrochloride	15E29-B02-309070	2
Fagron	Methadone hydrochloride	15E29-B02-309065	1
Fagron	Methadone hydrochloride	15E29-B02-309063	1
Fagron	Methadone hydrochloride	15E29_B02_309070	1
Fagron	Methadone hydrochloride	16B16-B02-318420	2
Fagron	Methadone hydrochloride	16B16-B02-318421	1
Fagron	Methadone hydrochloride	16F24B02323184	1
Fagron	Methadone hydrochloride	15B24-B02-304724	1
Fagron	Methadone hydrochloride	16F24-B02-323186	1
Fagron	Methadone hydrochloride	16F24-B02-326207	2
Fagron	Methadone hydrochloride	16K01-B04	2
Fagron	Methadone hydrochloride	15B24-B02-304724	5
Fagron	Methadone hydrochloride	16K01-B04-329937	1
Fagron	Methadone hydrochloride	17C24-B05-334309	1
Fagron	Methadone hydrochloride	25091406	1
Fagron	Methadone hydrochloride	29051502	1
Fagron	Methadone hydrochloride	414022-1-P	1
Fagron	Methadone hydrochloride	9041306	1
Fagron	Methadone hydrochloride	12H07-N05	4
Fagron	Methadone hydrochloride	1213E-02949	1
Fagron	Methadone hydrochloride	1225H008	1
Fagron	Methadone hydrochloride	1514H042	2
Fagron	Methadone hydrochloride	14H15-B01-299386	1
Fagron	Methadone hydrochloride	14H15-B01-299382	4
Fagron	Methadone hydrochloride	12A05-No2	1
Fagron	Methadone hydrochloride	11G11-N02	1
Fagron	Methadone hydrochloride	12b21-n03	1
Fagron	Methylrosanilinium ch...	12I17-N05	2
Fagron	Methylrosanilinium ch...	12H28_N06	1
Fagron	Methylrosanilinium ch...	12-17-N050109-140	1
Fagron	Methylrosanilinium ch...	13184811	2
Fagron	Methylrosanilinium ch...	12D19-0005	1
Fagron	Methylrosanilinium ch...	13G03-N11	2
Fagron	Methylrosanilinium ch...	13G03N11	1
Fagron	Methylrosanilinium ch...	13H28-No3	1
Fagron	Methylrosanilinium ch...	13H28-N03-0161-1030	1
Fagron	Methylrosanilinium ch...	13H28-N03	2
Fagron	Methylrosanilinium ch...	13H28-NO3	2
Fagron	Methylrosanilinium ch...	12D19-N01	4
Fagron	Methylrosanilinium ch...	13G03-N011	1
Fagron	Midazolam	14C12-B31-313222	1
Fagron	Midazolam	16J03-B09-326963	1
Fagron	Midazolam hydrochloride	14C19-B04	1
Fagron	Midazolam hydrochloride	14H05-B08-297982	1
Fagron	Midazolam hydrochloride	13E22-N09	2
Fagron	Midazolam hydrochloride	15H04-B03-314396	1
Fagron	Midazolam hydrochloride	9D27-N01	2
Fagron	Morphine hydrochloride	15A12-B04-303137	1
Fagron	Morphine hydrochloride	12E10N04	1
Fagron	Morphine hydrochloride	11A27-N04	1
Fagron	Morphine hydrochloride	B03-292079	1
Fagron	Morphine hydrochloride	15J27_B01_316889	1
Fagron	Morphine hydrochloride	15I09-B08-312693	1
Fagron	Morphine hydrochloride	13H22-N12	1
Fagron	Morphine hydrochloride	12E10-N04	2
Fagron	Morphine hydrochloride	13D09-N04	1
Fagron	Nettle leaf, cut	12184702	4
Fagron	Nitrofurantoin	201203080296	1

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Supplier	Substance	Batch	Spectra
Fagron	Nitrofurantoin	15J15-B06-317250	2
Fagron	Nitrofurantoin	15J15-B06-313939	1
Fagron	Nitrofurantoin	15J15-B06	2
Fagron	Nitrofurantoin	13D10-N03	1
Fagron	Nitrofurantoin	13B28-N07	1
Fagron	Nitrofurantoin	13A08-N01	1
Fagron	Nitrofurantoin	11F07-N06	3
Fagron	Nitrofurantoin	71/14	1
Fagron	Nitrofurantoin	3071403	1
Fagron	Nitrofurantoin	12C30-N03	1
Fagron	Nitrofurantoin	15J15-B06-315225	1
Fagron	Nitrofurantoin	2714I-03527	1
Fagron	Nystatin	11L21-N02	1
Fagron	Nystatin	20121202	1
Fagron	Nystatin	13C11-N08	1
Fagron	Nystatin	4014376	1
Fagron	Nystatin	12G04-N12	1
Fagron	Nystatin	12C29-N09	3
Fagron	Nystatin	11K11-No4	1
Fagron	Nystatin	11K11-N04	1
Fagron	Nystatin	11C21-N10	1
Fagron	Orris root	11026705	3
Fagron	Peppermint leaf, cut	1234567	2
Fagron	Peppermint leaf, cut	13030803	3
Fagron	Phenobarbital	15G07-B06-311718	1
Fagron	Phenobarbital	13G05-N09	2
Fagron	Potassium hydrocarbon…	11/26-N14	1
Fagron	Potassium hydrocarbon…	120801001	1
Fagron	Potassium hydrocarbon…	12141911	1
Fagron	Potassium hydrocarbon…	12C12-N02	2
Fagron	Potassium hydrocarbon…	12K27-N06	2
Fagron	Potassium hydrocarbon…	13031205	1
Fagron	Potassium hydrocarbon…	3413M-01728	1
Fagron	Potassium hydrocarbon…	10G22-N10	1
Fagron	Prednisolone 1:10 (ri…	12D04-N01	1
Fagron	Prednisolone 1:10 (ri…	12L19-N06	1
Fagron	Psyllium seed	3610U-02243	1
Fagron	Rhubarb, powdered	11043821	1
Fagron	Rutoside trihydrate	L14050127	1
Fagron	Rutoside trihydrate	13K12-B06	1
Fagron	Sage leaf, cut	2301A120403	49
Fagron	Senna leaf, cut	314Q1514	1
Fagron	Sodium alginate	14G22-B99	1
Fagron	Sodium carbonate deca…	12B16-N01	1
Fagron	Sodium dihydrogen pho…	12L05-N05	1
Fagron	Sodium hydrogen carbo…	RBA3421100	6
Fagron	Sodium hydrogen carbo…	RBA3631200	1
Fagron	Sodium hydrogen carbo…	11I12-N16	5
Fagron	Sodium hydrogen carbo…	13G11-N03	3
Fagron	Sodium hydrogen carbo…	11/12-N16	2
Fagron	Sodium hydrogen carbo…	RBA3651200	2
Fagron	Sodium hydrogen carbo…	RBA1661100	1
Fagron	Sodium hydrogen carbo…	13B18-N03	7
Fagron	Sodium hydrogen carbo…	4413I01892	1
Fagron	Sodium hydrogen carbo…	11K25-N05	4
Fagron	Sodium hydrogen carbo…	12D11N02	2
Fagron	Sodium hydrogen carbo…	11e31-n04	1
Fagron	Sodium hydrogen carbo…	RBA0021100	1
Fagron	Sodium hydrogen carbo…	13D29-N09	6
Fagron	Sodium hydrogen carbo…	13B12-N01	1

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Supplier	Substance	Batch	Spectra
Fagron	Sodium hydrogen carbo…	12B06-N01	3
Fagron	Sodium hydrogen carbo…	12G11-N03	9
Fagron	Sodium hydrogen carbo…	12D11-No2	1
Fagron	Sodium hydrogen carbo…	12D11-NO2	2
Fagron	Sodium hydroxide pell…	13k22-no5	1
Fagron	Sodium hydroxide pell…	12E02-N15	2
Fagron	Sodium hydroxide pell…	13F06-NO2	3
Fagron	Sodium monohydrogenph…	13H01-B01	1
Fagron	Sodium monohydrogenph…	613I-01914	1
Fagron	Sodium monohydrogenph…	11K07-N10	1
Fagron	Sodium monohydrogenph…	12H21-N03	1
Fagron	Sodium monohydrogenph…	13D24-N12	3
Fagron	Sodium monohydrogenph…	11K30-N01	1
Fagron	Sodium monohydrogenph…	B44888A	2
Fagron	Sodium monohydrogenph…	1513I-01914	1
Fagron	Sodium monohydrogenph…	2111E-01914	1
Fagron	Sodium sulfate decahy…	11H01-N06	1
Fagron	Sodium sulfate decahy…	1464	1
Fagron	Sodium sulfate decahy…	12H31-N04	2
Fagron	Sodium sulfate decahy…	12E30-N09	1
Fagron	Sodium sulfate decahy…	2134	2
Fagron	Sodium thiosulfate pe…	14A28-B08-290696	1
Fagron	Sodium thiosulfate pe…	12F20-N10	1
Fagron	Sodium thiosulfate pe…	12F20-N20	1
Fagron	Sodium thiosulfate pe…	3313U-01922	1
Fagron	Sodium thiosulfate pe…	13092013E	1
Fagron	Sulfanilamide	11L01-No8	1
Fagron	Thiomersal	12C08-NO2	1
Fagron	Thiomersal	13E22-N13	1
Fagron	Thiomersal	12J17-NO2	1
Fagron	Thiomersal	12F19-N11	1
Fagron	Thiomersal	12|17-NO2	1
Fagron	Triamcinolone acetoni…	14F17-NO2	1
Fagron	Triamcinolone acetoni…	13F21-N01	2
Fagron	Triamcinolone acetoni…	12l07-N04	1
Fagron	Triamcinolone acetoni…	12I07-No4	1
Fagron	Triamcinolone acetoni…	13F20-N010113/150	1
Fagron	Triamcinolone acetoni…	12E23-N01	5
Fagron	Triamcinolone acetoni…	12I07-N04	1
Fagron	Triamcinolone acetoni…	12G23-N06	3
Fagron	Triamcinolone acetoni…	12F21-N01	1
Fagron	Triamcinolone acetoni…	11G14-N02	1
Fagron	Triamcinolone acetoni…	12107-N04022/359	1
Fagron	Tricalcium phosphate	12G10-N05	1
Fagron	Tricalcium phosphate	12I13-N03	1
Fagron	Trichloroacetic acid	13B19-M04	1
Fagron	Trichloroacetic acid	13H22-M04	1
Fagron	Trichloroacetic acid	10379405	1
Fagron	Wild pansy, cut		1
Fagron	Yarrow herb, cut	3613M-0165	1
Falcento	D-(+)-mannose	R-4639	2
Falcento	D-(+)-mannose	R4640	1
Falcento	D-(+)-mannose	R-4641	1
Falcento	D-(+)-mannose	R-4638	1
Falcento	D-ribose	201209702	1
Falcento	D-ribose	JXCZSJ14-D-010	1
Falcento	D-ribose	201206712	2
fargon	Magnesium sulfate hep…	12E22-N02	4
Fargon	Caffeine citrate	11F21-N05	1
Fargon	Caffeine citrate	12J05-N06	4

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Supplier	Substance	Batch	Spectra
Fargon	Heavy alkaline bismut…	11C10-N06	1
Fargon	Hydromorphone hydroch…	13127-N05	1
FARGON	Aluminium chloride he…	13d22-n09	1
Fargon / Gehe	Cinnamon, cut	15104201	1
Fargon/17.07.2013/Now…	Triamcinolone acetoni…	12|07-N04	1
Fargon/Phoenix	Caffeine citrate	15A05-B03-302746	11
Fargron	Triamcinolone acetoni…	11E19-N011	1
Fargron/Noweda	Sweet fennel	2870A150810	1
Faron	Aluminium chloride he…	13I13-B03-287298	1
Fgron	Caffeine citrate	2013Q-01282	1
Fiebig	Acorus root, peeled	6701B120427	9
Fiebig	Aluminium chloride he…	11J06-N03	1
Fiebig	Dandelion herb with r…	11003313	1
Fiebig	Frankincense	10349213	3
Fiebig	Ginkgo leaf, cut	13340902	1
Fiebig	Ginkgo leaf, cut	12373604	4
Fiebig	Mistletoe, cut	10273406	1
Fiebig	White deadnettle herb…	11371710	3
Fiebig 04.01.13 ek: 1…	Bilberry fruit, dried	2910N110304	6
Fiebig 05.11.12 ek:9…	Bilberry fruit, dried	2910A120410	2
Fiebig 14.02.13 ek:3…	Melilot herb, cut	12231701	3
Finze	Centaury, cut	11097610	3
Finze	Elder flower, rubbed	9297415	3
Finze	Equisetum stem, cut	11076305	10
Finze	Knotgrass, cut	10237202	1
Finze	Linseed	3607E-02240	1
Finze	Lycopodium herb, cut	9378803	1
Finze	Male speedwell wort, …	4661B110121	2
Finze	Male speedwell wort, …	4661B080915	1
Finze	Matricaria flower	12361703	8
Finze	Matricaria flower	1290B101122	1
Finze	Sodium hydrogen carbo…	Pr.Nr.4311Q-01892	1
Finze	St. John's wort, cut	9297303	1
Finze	Wild thyme, cut	11031204	1
fischar	Sodium hydrogen carbo…	6522101	6
Fischar	Copper (II) sulfate p…	9452011	1
Fischar	Sodium hydrogen carbo…	6521111	9
fragon	Sodium sulfate decahy…		1
Gahlke	Aniseed, pounded	21401	1
Gahlke	Bitter fennel	20362	1
Gahlke	Frankincense	21949	1
Gahlke	Parsley root, cut	20872	1
Gahlke	Sorrel herb, cut	21479	1
Gahlke	Sweet woodruff herb, …	22100	1
galke	Aniseed	19654	1
galke	Bitter fennel	19938	3
galke	Matricaria flower	18471	6
galke	Melissa leaf, cut	20867	1
galke	Nettle leaf, cut	21639	1
galke	Yellow chaste weed, cut	nachprüfung	1
Galke	Acorus root, peeled	18944	1
Galke	Agrimony, cut	2002	1
Galke	Alchemilla, cut	19835	1
Galke	Alchemilla, cut	21141	1
Galke	Alchemilla, cut	22291	1
Galke	Aniseed	23464	1
Galke	Aniseed	22274	1
Galke	Aniseed	21278	1
Galke	Asparagus root, cut	20178	1
Galke	Bean shells, cut	21219	1

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Supplier	Substance	Batch	Spectra
Galke	Bearberry leaf, cut	19936	3
Galke	Birch leaf, cut	21226	1
Galke	Birch leaf, cut	20904	1
Galke	Bitter fennel	22176	1
Galke	Blackcurrants	21348	1
Galke	Blue bottle flower wi...	23131	2
Galke	Boldo leaf, cut	19855	1
Galke	Burdock root, cut	19802	1
Galke	Caraway fruit	21257	1
Galke	Caraway fruit	27450	1
Galke	Caraway fruit	23627	1
Galke	Caraway fruit, pounded	18943	1
Galke	Centaury, cut	9721	1
Galke	Chelidonium majus her...	20937	3
Galke	Common broom herb, cut	12358803	4
Galke	Common broom herb, cut	21610	1
Galke	Common wormwood herb,...	21637	1
Galke	Couch grass rhizome, ...	18781	1
Galke	Dandelion herb with r...	20531	6
Galke	Dandelion herb with r...	22093	2
Galke	Dandelion root, cut	126302	1
Galke	Dandelion root, cut	20658	1
Galke	Devil's claw root	21018	2
Galke	Devil's claw root	20282	2
Galke	Dill fruit	22422	4
Galke	Elder flower, rubbed	21934	1
Galke	Elecampane rhizome, cut	21569	2
Galke	Equisetum stem, cut	22061	1
Galke	Equisetum stem, cut	19663	5
Galke	Euphrasy herb, cut	20262	2
Galke	Gentian root, cut	19192	2
Galke	Geum urbanum herb, cut	20881	1
Galke	Ginger, peeled	21766	2
Galke	Ginger, peeled	20633	1
Galke	Goat's rue, cut	8378	2
Galke	Hawthorn leaf with fl...	21126	3
Galke	Hay flower	21926	1
Galke	Hop strobile	20928	2
Galke	Hop strobile	20928	3
Galke	Hop strobile	23363	1
Galke	Horse chestnut flower...	2614	1
Galke	Hyssop herb, cut	20939	1
Galke	Iceland moss, cut	12369	1
Galke	Ladys bedstraw herb,...	21942	2
Galke	Lavender flower	21416	2
Galke	Lemon peel, cut	22975	1
Galke	Liqourice root, peeled	23538	1
Galke	Lungwort herb, cut	19511	4
Galke	Lycopodium herb, cut	16913	3
Galke	Mallow flower, cut	21119	1
Galke	Mallow leaf, cut	17133	1
Galke	Mallow leaf, cut	21445	1
Galke	Mallow leaf, cut	21454	1
Galke	Manna, powdered	19784	1
Galke	Manna, powdered	20669	1
Galke	Marian thistle fruit	22187	4
Galke	Marjoram herb, rubbed	23241	1
Galke	Marjoram herb, rubbed	22401	1
Galke	Masterwort root, cut	23074	1
Galke	Masterwort root, cut	18411	1

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Supplier	Substance	Batch	Spectra
Galke	Maté leaf, cut	22365	1
Galke	Matricaria flower	18803	1
Galke	Matricaria flower	21652	1
Galke	Meadowsweet herb, cut	20358	1
Galke	Mistletoe, cut	20328	1
Galke	Mistletoe, cut	22012	2
Galke	Nettle leaf, cut	23302	1
Galke	Nettle leaf, cut	20956	1
Galke	Nettle leaf, cut	21238	1
Galke	Nutmeg, powdered (spi...	22739	1
Galke	Oak bark, cut	17824	2
Galke	Orris root	21303	1
Galke	Peppermint leaf, cut	20975	3
Galke	Peppermint leaf, cut	22218	1
Galke	Peppermint leaf, cut	22783	3
Galke	Primrose flower	22612	2
Galke	Psyllium seed	20968	2
Galke	Psyllium seed	22989	7
Galke	Raspberry leaf, cut	23532	1
Galke	Raspberry leaf, cut	19499	2
Galke	Raspberry leaf, cut	18060	2
Galke	Raspberry leaf, cut	21244	1
Galke	Red clover flower	23128	2
Galke	Red-rose petal	22641	2
Galke	Restharrow root, cut	12700	1
Galke	Ribwort plantain, cut	21598	1
Galke	Ribwort plantain, cut	20259	1
Galke	Rosemary leaf, cut	21390	1
Galke	Rosemary leaf, cut	19813	1
Galke	Rosemary leaf, cut	22777	1
Galke	Sage leaf, cut	21015	3
Galke	Sanicle herb, cut	23097	1
Galke	Senna leaf, cut	21778	1
Galke	Shepherd's purse, cut	19483	1
Galke	Shepherd's purse, cut	21719	2
Galke	Silverweed, cut	12891	2
Galke	St. John's wort, cut	21556	1
Galke	St. John's wort, cut	23054	1
Galke	St. John's wort, cut	21990	4
Galke	St. John's wort, cut	21034	1
Galke	Tall golden rod, cut	21079	2
Galke	Thyme, rubbed	20719	2
Galke	Thyme, rubbed	1833	1
Galke	Thyme, rubbed	19386	2
Galke	Thyme, rubbed	28719	1
Galke	Tormentil	21744	2
Galke	Tormentil	21091	1
Galke	Turmeric root, cut	20184	1
Galke	Turmeric root, cut	23123	1
Galke	Turmeric, javanese, cut	15540	1
Galke	Turmeric, javanese, cut	15540	1
Galke	Valerian root, cut	22070	1
Galke	Valerian root, cut	21798	4
Galke	Walnut leaf, cut	21061	1
Galke	White deadnettle flower	21691	4
Galke	White deadnettle flower	22704	1
Galke	White deadnettle herb...	19706	1
Galke	White deadnettle herb...	22253	2
Galke	Willow bark, cut	20338	1
Galke	Willowherb, small flo...	47502	1

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Supplier	Substance	Batch	Spectra
Galke	Willowherb, small flo…	22347	4
Galke	Wormwood herb, cut	21330	1
Galke	Yarrow herb, cut	22048	7
Galke	Yarrow herb, cut	21295	2
Galke	Yarrow herb, cut	23318	1
Galke	Yarrow herb, cut	23735	1
galke,	Calendula flower	12028	1
galke,	Lime flower, cut	2098	1
gasser	Angelica root	950049	1
Gatt Koller/Herba	Amphetamine sulfate	942/03130814	1
Gatt-Koller	Betaine hydrochloride	2970/07102910	1
gebepharm	Sodium monohydrogenph…	20160909-2	1
gehe	Agnus castus fruit	13193407	1
gehe	Cinnamon, cut	13304412	1
gehe	Methadone hydrochloride	17239502	1
gehe	Methadone hydrochloride	16135316	3
Gehe	Acorus root, peeled	6701B130807	12
Gehe	Alchemilla, cut	1341102	1
Gehe	Aluminium chloride he…	12/27-No1	1
Gehe	Aluminium chloride he…	12114902	5
Gehe	Aluminium chloride he…	130701102	1
Gehe	Aluminium chloride he…	12/27-n01	2
Gehe	Aluminium chloride he…	1204026-01	28
Gehe	Angelica root	285732	1
Gehe	Angelica root	269740	2
Gehe	Aniseed, pounded	13149903	1
Gehe	Arnica flower	11259801	2
Gehe	Barberries	2720N111109	1
Gehe	Betamethasone-17-vale…	12G02-N02	4
Gehe	Betamethasone-17-vale…	12C19-N07	3
Gehe	Betony herb, cut	12007201	2
Gehe	Birch leaf, cut	264603	2
Gehe	Bitter fennel	12035102	3
Gehe	Blackberry leaf, cut	10136409	2
Gehe	Caffeine citrate	13B08-N02	3
Gehe	Calcium hydroxide	12F08-N02	3
Gehe	Calendula flower, cut	266676	1
Gehe	Calendula flower, cut	260205	1
Gehe	Chickweed, cut	10359112	1
Gehe	Chicory herb, cut	10325608	1
Gehe	Clobetasol-17-propion…	12/19-N01	2
Gehe	Clobetasol-17-propion…	1109D005	1
Gehe	Codeine phosphate hem…	15350710	2
Gehe	Coltsfoot leaf, cut	269261	2
Gehe	Couch grass rhizome, …	12186704	1
Gehe	Couch grass rhizome, …	283061	1
Gehe	Dandelion herb with r…	6611B120620	29
Gehe	Dandelion herb with r…	6611B110104	1
Gehe	Dandelion herb with r…	13019803	1
Gehe	Dandelion herb with r…	266855	1
Gehe	Dandelion herb withou…	4591C111010	2
Gehe	Deoxycholic acid	2012060253	1
Gehe	Devil's claw root	1114005	1
Gehe	Dexamethasone 1:10 (r…	12E30-N16	1
Gehe	Dill fruit	2680A121211	4
Gehe	Elder berries	12267807	1
Gehe	Elecampane rhizome, cut	1116905	1
Gehe	Elecampane rhizome, cut	12113302	2
Gehe	Elecampane rhizome, cut	11196906	1
Gehe	Equisetum stem, cut	10375515	1

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Supplier	Substance	Batch	Spectra
Gehe	Equisetum stem, cut	10375510	2
Gehe	Fenugreek	13013811	2
Gehe	Frangula bark, cut	11254006	6
Gehe	Frangula bark, cut	11254004	7
Gehe	Frangula bark, cut	11254003	2
Gehe	Frankincense	12120002	1
Gehe	Fumitory, cut	13202907	1
Gehe	Galeopsis herb, cut	3911A130320	6
Gehe	Hawthorn leaf with fl…	1351B111207	2
Gehe	Horse chestnut leaf, …	2551B131024	1
Gehe	Iceland moss, cut	11053915	1
Gehe	Iceland moss, cut	5191A130116	2
Gehe	Iceland moss, cut	11101605	2
Gehe	Iceland moss, cut	13350805	7
Gehe	Iceland moss, cut	11101603	2
Gehe	Ivy leaf, cut	11229501	1
Gehe	Liqourice root, peeled	268835	2
Gehe	Liquorice root, natur…	283316	1
Gehe	Liquorice root, natur…	277004	2
Gehe	Lycopodium herb, cut	521103845	1
Gehe	Mallow leaf, cut	10290512	2
Gehe	Marjoram herb, rubbed	4881A100929	4
Gehe	Matricaria flower	276095	12
Gehe	Matricaria flower	12133009	1
Gehe	Matricaria flower	281103	5
Gehe	Matricaria flower	11255204	1
Gehe	Matricaria flower	268408	2
Gehe	Matricaria flower	270579	1
Gehe	Matricaria flower	12337605	1
Gehe	Matricaria flower	265419	4
Gehe	Melilot herb, cut	110324	1
Gehe	Mistletoe, cut	264539	1
Gehe	Nettle leaf, cut	10162701	1
Gehe	Nettle root, cut	6631B120927	15
Gehe	Parsley herb, rubbed	10269905	1
Gehe	Parsley root, cut	6441A110210	4
Gehe	Peppermint leaf, cut	2161A121029	18
Gehe	Peppermint leaf, cut	2181B130717A	1
Gehe	Peppermint leaf, cut	2181B130717B	1
Gehe	Primrose flower	11374401	1
Gehe	Rhubarb, cut	11057817	6
Gehe	Rhubarb, cut	13235208	2
Gehe	Ribwort plantain, cut	4271A111125	3
Gehe	Rose hips with peel, …	2840A120719	1
Gehe	Rue herb, cut	12148802	1
Gehe	Sage leaf, cut	275598	5
Gehe	Sage leaf, cut	277580	7
Gehe	Sage leaf, cut	265630	4
Gehe	Sage leaf, cut	269030	6
Gehe	Shepherd's purse, cut	11036410	2
Gehe	Silverweed, cut	11328101	1
Gehe	Sodium hydrogen carbo…	11078315	1
Gehe	Sodium monohydrogenph…	12109001	2
Gehe	St. John's wort, cut	9297305	1
Gehe	St. John's wort, cut	259604	1
Gehe	St. John's wort, cut	11185602	1
Gehe	Tall golden rod, cut	11207011	2
Gehe	Thyme, rubbed	4622A110120	1
Gehe	Triamcinolone acetoni…	13A15-N05	2
Gehe	Triamcinolone acetoni…	12A05-N07	4

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Supplier	Substance	Batch	Spectra
Gehe	Walnut bark, cut	1135602	1
Gehe	Walnut leaf, cut	10050412	1
Gehe	Walnut leaf, cut	211A120123	1
Gehe	White deadnettle flower	3915-091	1
Gehe	Wild pansy, cut	276259	1
Gehe	Wormwood herb, cut	13381901	1
Gehe	Yarrow flower, rubbed	12267702	2
Gehe	Yarrow herb, cut	1128503	1
GEHE	Burdock root, cut	10073213	2
GEHE	Dexamphetamine sulfate	12F11-N01	1
GEHE	Dexamphetamine sulfate	635J7FA70021	1
GEHE	Dexamphetamine sulfate	635JFA70029	2
GEHE	Equisetum stem, cut	270045	3
GEHE	Hawthorn leaf with fl...	1971A120215	8
GEHE	Marshmallow root, pee...	12145311	1
GEHE	Methylrosanilinium ch...	928104	1
GEHE	Raspberry leaf, cut	272989	1
GEHE	Rhubarb, cut	11321802	1
GEHE	St. John's wort, cut	2477580	1
GEHE	Thyme, rubbed	521205633	1
GEHE	Trichloroacetic acid	10379406	2
GEHE	Walnut leaf, cut	21022101/1	1
GEHE	Yarrow herb, cut	11280514	4
GEHE	Yarrow herb, cut	11306302	1
Gehe / 08.03.13 Redwood	Blessed thistle, cut	205007	1
Gehe 02.07.2013	Raspberry leaf, cut	11030701	1
Gehe 06.05.2013	Matricaria flower	11169606	1
Gehe 06.08.2013	Raspberry leaf, cut	10013411	3
gehe 07.12.2013	Sage leaf, cut	2301/7120403	1
Gehe 08.07.2013	Aniseed	1303780L	1
Gehe 09.03.13	Large waybread herb, ...	12374104	10
GEHE 10.03.2014	Oak bark, cut	761A11816	1
Gehe 10.05.2013	Raspberry leaf, cut	2291A120507	9
gehe 10.12.13	Raspberry leaf, cut	229117121120	1
Gehe 12.04.2013	Fenugreek	12252602	4
Gehe 12.04.2013	Juniper, pounded	13020903	2
Gehe 12.04.2013	Tricalcium phosphate	12/13.N03	1
Gehe 15.07.2013	Aluminium chloride he...	13022N09	1
Gehe 18.12.12	Dandelion root, cut	11003313	2
Gehe 18.12.12	Elecampane rhizome, cut	12113303	2
gehe 20.11.13	Fumitory, cut	3881B111013	2
Gehe 21.05.2013	Angelica root	278757	8
Gehe 21.05.2013	Tormentil	12040713	2
gehe 21.08.2013	Nettle root, cut	11265004	5
GEHE 21.10.2014	Deoxycholic acid	13F13-N06	1
Gehe 28.03.2013	Aluminium potassium s...	12184406	3
gehe 90.09.13	Ginger, peeled	13100601	1
Gehe am 14.01.2013	Euphrasy herb, cut	270726	1
Gehe am 27.03.2014	Juniper, pounded	2890A130513	1
gehe, 09.01.2013	Elder flower, rubbed	1571A1202015	2
gehe, 11.01.2013	Mistletoe, cut	11294001	2
Gehe/Noweda	Methadone hydrochloride	16135319	2
Gehe08.06.2013	Senna leaf, cut	2331-B-130241	2
Gesundform	Mistletoe, cut	216482	1
Großhandel	Almonds, bitter, whole	40A100901	1
Großhandel	Angelica root	272721	1
Großhandel	Bitter orange flower ...	12266610	1
Großhandel	Bitter orange flower ...	12266602	3
Großhandel	Bitter orange flower ...	12266612	1
Großhandel	Bitter orange flower ...	11049213	1

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Supplier	Substance	Batch	Spectra
Großhandel	Bitter orange flower …	12266606	1
Großhandel	Bitter orange flower …	12266607	1
Großhandel	Eleutherococcus, cut	10381816	1
Großhandel	Magnesium chloride he…	12141807	4
Großhandel	Mallow flower, cut	1501B111215	2
Großhandel	Matricaria flower	1290A120403	4
Großhandel	Nutmeg	7320A110825	1
Großhandel	Nutmeg	7320A130911	1
Großhandel	Nystatin	12158010	7
Großhandel	Passionflower herb, cut	12031706	4
Großhandel	Tall golden rod, cut	11280311	5
Großhandel	Thyme, rubbed	4622A12011	1
Großhandel	Valerian root, cut	12033809	13
Gutenberg-Apotheke	Agnus castus fruit	61765	1
Gutenberg-Apotheke	Aniseed	1333902	1
Gutenberg-Apotheke	Barberries	12217109	4
Gutenberg-Apotheke	Elder berries	3010N120921	4
Gutenberg-Apotheke	Nettle leaf, cut	18897	1
Gutenberg-Apotheke	Raspberry leaf, cut	28911	1
Haustee	Mistletoe, cut	57010507	1
HBK Gesundheit	Maltodextrin	2343	1
HBK Gesundheit	Maltodextrin	1143	4
Hedinger	Dandelion herb with r…	10121614	1
Hedinger	Dihydrocodeine hydrog…	70162	4
Hedinger	Linseed	16011402	1
Hedinger	Magnesium sulfate hep…	204035	4
Hedinger	Magnesium sulfate hep…	204037	2
Hedinger	Rhubarb, powdered	13193110	1
Hedinger/ Sanacorp	Methadone hydrochloride	15215505	4
Hedinger/Phönix	Sodium sulfate decahy…	205025	2
Hepart AG	Alchemilla, cut	21963	3
Hepart AG	Alchemilla, cut	B-698kbA	1
Hepart AG	Aniseed	B216346,kbA	1
Hepart AG	Bitter fennel	B492,kbA	1
Hepart AG	Bitter orange flower …	B120822	1
Hepart AG	Black cumin seed	20720,kbA	1
Hepart AG	Blackthorn flower, ru…	N101109	2
Hepart AG	Buckwheat herb, cut	B120509	2
Hepart AG	Caraway fruit	B-224,kbA	1
Hepart AG	Daisy flower	A130307	1
Hepart AG	Dill fruit	L30057kbA	1
Hepart AG	Equisetum stem, cut	B-695,kbA	1
Hepart AG	Fenugreek	A120118	2
Hepart AG	Hawthorn flower	13010401	1
Hepart AG	Lavender flower	A130214	4
Hepart AG	Male speedwell wort, …	C130226	5
Hepart AG	Matricaria flower	B-477,kbA	1
Hepart AG	Melilot herb, cut	A110324	6
Hepart AG	Mullein flower, cut	12170904	3
Hepart AG	Nettle leaf, cut	P234605kbA	1
Hepart AG	Primrose flower	11374403	3
Hepart AG	Primrose flower	13086602	5
Hepart AG	Restharrow root, cut	B130404	3
Hepart AG	Ribwort plantain, cut	20832	5
Hepart AG	Robert herb, cut	A110621	6
Hepart AG	Savory, rubbed	12177205	3
Hepart AG	St. John's wort, cut	B-445,kbA	1
Hepart AG	Stemless carline root	B120726	1
Hepart AG	Thyme, rubbed	A130109	2
Hepart AG	Walnut leaf, cut	A120123	1

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Supplier	Substance	Batch	Spectra
Hepart AG	Willow bark, cut	B100910	6
Hepart AG	Willowherb, small flo…	10326110	2
Herbasinica	Agrimony, cut	11374007	1
Herbasinica	Bitter fennel	1294710	1
Herbasinica	Black cohosh, cut	nachprüfung	1
Herbasinica	Blackthorn flower	nachprüfung	1
Herbasinica	Blue bottle flower wi…	nachprüfung	1
Herbasinica	Chickweed, cut	nachprüfung	2
Herbasinica	Heavy alkaline bismut…	nachprüfung	1
Herbasinica	Lavender flower	1488A130830	1
Herbasinica	Lavender flower	nachprüfung	1
Herbasinica	Magnesium sulfate hep…	1303008-01	7
Herbasinica	Marian thistle fruit	nachprüfung	1
Herbasinica	Meadowsweet herb, cut	10381604	11
Herbasinica	Potassium hydroxide	11165708	2
Herbasinica	Primrose flower	nachprüfung	1
Herbasinica	Red-rose petal, cut	nachprüfung	1
Herbasinica	Rose mallow flower, cut	nachprüfung	1
Herbasinica	Sodium hydrogen carbo…	12324704	5
Herbasinica	Tormentil	nachprüfung	3
Hersteller: EuRho	Nystatin	1107036-01	9
Hersteller: Klenf	Coltsfoot leaf, cut	2021B120124	7
himb	Birch leaf, cut	12193104	2
HiperScan	Peppermint leaf, cut		2
Hof-Apotheke,St.Afra	Comfrey root	125041	1
Hofmann Sommer	Maté leaf, cut	2141a111213	3
Holdermann	Fuchsine	11K18-N02	1
Holdermann	Tormentil	12040708	12
holdermann euro	Potassium hydrocarbon…	1303002-01	5
Hollborn	Bromothymol blue	III13	1
Hubertus Apotheke	Equisetum stem, cut	3831C140403	1
Ichthyol	Acorus root, peeled	272703	1
Ichthyol/Phoenix	Fenugreek, powdered	14377205	1
ICHTHYOL-GESELLSCHAFT	Sodium monohydrogenph…	Caelo	1
Ichtyol/Phönix	Alchemilla, cut	13141107	5
Ichtyol/Phönix	Zinc orotate dihydrate	12B02-N02	1
Jenne	Aniseed	2700A131015	3
Jenne	Kaolin, heavy	13041803	3
Jenne	Methadone hydrochloride	15B24-B02	1
JENNE	Tragacanth, powdered	16110801	1
Jinzhou Donghhui Phar…	Dimercaptosuccinic acid	121115	1
k	Matricaria flower	1290A140513	1
KBA Ware	Equisetum stem, cut	21879	6
Kehr	Mallow flower, cut	10357908	3
Kehr	Mullein flower, cut	11020901	1
Kehr	Sodium monohydrogenph…	11K30-N01	2
Kehr	Stemless carline root	6191B1111205	1
Kehr	Zedoary root, cut	12125301	5
Kenk / Phoenix	Calendula flower, cut	1241B130517	5
Kenk / Phoenix	Daisy flower	1210A130307	4
Kenk / Phoenix	Dandelion herb with r…	6611B130321	32
Kenk / Phoenix	European golden rod, …	1781B110826	1
Kenk / Phoenix	Frangula bark, cut	661B110412	5
Kenk / Phoenix	Hawthorn leaf with fl…	1971A130307	5
Kenk / Phoenix	Hop strobile	1451B130409	8
Kenk / Phoenix	Juniper	2890A120709	18
Kenk / Phoenix	Lapacho wood, cut	5161A110204	1
Kenk / Phoenix	Lavender flower	1489A120103	27
Kenk / Phoenix	Lavender flower	1489A130214	17
Kenk / Phoenix	Marian thistle herb, …	3701B120717	3

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Supplier	Substance	Batch	Spectra
Kenk / Phoenix	Melilot herb, cut	4151A110324	9
Kenk / Phoenix	Raspberry leaf, cut	22781C120508	1
Kenk / Phoenix	Rose hips with peel, ...	2841B111019	3
Kenk / Phoenix	Sage leaf, cut	2301A130904	1
Kenk / Phoenix	St. John's wort, cut	4021A120604	23
Kenk / Phoenix	Turmeric, javanese, cut	6731B130117	1
Kle	Dill fruit	2680A110204	1
Klenk	Abrotani herb, cut	pzn4288802	1
Klenk	Abrotani herb, cut	3451a120312	2
Klenk	Abrotani herb, cut	3451A120312	21
Klenk	Abrotani herb, cut	26011403	1
Klenk	Abrotani herb, cut	21081301	1
Klenk	Acorus root, natural,...	B130807	1
Klenk	Acorus root, peeled	6701B12031	1
Klenk	Acorus root, peeled	6701B130103	24
Klenk	Acorus root, peeled	6701B120301	3
Klenk	Acorus root, peeled	6711B110606	1
Klenk	Acorus root, peeled	6701b120301	1
Klenk	Acorus root, peeled	106212173	1
Klenk	Acorus root, peeled	nachprüfung	1
Klenk	Acorus root, peeled	6701B150407	1
Klenk	Acorus root, peeled	6701b130807	2
Klenk	Acorus root, peeled	6701b130103	2
Klenk	Acorus root, peeled	6701B130870	1
Klenk	Acorus root, peeled	6701B120817	7
Klenk	Acorus root, peeled	67001B1203	1
Klenk	Acorus root, peeled	4797362	1
Klenk	Agarikon	1061a120312	1
Klenk	Agnus castus fruit	7110N150121	1
Klenk	Agnus castus fruit	A120803	1
Klenk	Agnus castus fruit	A110614	3
Klenk	Agnus castus fruit	A130613	1
Klenk	Agnus castus fruit	7110N090701	1
Klenk	Agnus castus fruit	12274007	3
Klenk	Agnus castus fruit	7110A110614	2
Klenk	Agnus castus fruit	7110A130613	1
Klenk	Agrimony, cut	3481C120508	1
Klenk	Alchemilla, cut	3501A110301	4
Klenk	Alchemilla, cut	3501B100428	2
Klenk	Alchemilla, cut	3501C121105	2
Klenk	Alchemilla, cut	3501B090417	1
Klenk	Almonds, bitter, whole	40A150904	6
Klenk	Almonds, bitter, whole	40A161028	4
Klenk	Almonds, bitter, whole	40A130909	10
Klenk	Almonds, bitter, whole	40A120924	8
Klenk	Almonds, bitter, whole	40A140908	18
Klenk	Almonds, bitter, whole	40A111117	8
Klenk	Almonds, bitter, whole	40A111004	1
Klenk	Almonds, bitter, whole	40A161206	3
Klenk	Almonds, bitter, whole	40A161005	1
Klenk	Almonds, bitter, whole	40A-150904	2
Klenk	Almonds, bitter, whole	40A0130909	1
Klenk	Angelica root	6081n120110	1
Klenk	Angelica root	6085B120614	1
Klenk	Angelica root	6081B130109	7
Klenk	Angelica root	6081b130109	2
Klenk	Angelica root	6081B130410	3
Klenk	Angelica root	6082b130410	1
Klenk	Angelica root	B130109	2
Klenk	Angelica root	6081B140918	1

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Supplier	Substance	Batch	Spectra
Klenk	Angelica root	6091B130109	1
Klenk	Angelica root	6081B150701	3
Klenk	Angelica root	6081B130726	1
Klenk	Angelica root	6081B130109	1
Klenk	Angelica root	6081N100618	3
Klenk	Angelica root	6081N120110	19
Klenk	Aniseed	2700A120320	14
Klenk	Aniseed	2700A110701	10
Klenk	Aniseed	2700A12107	1
Klenk	Aniseed	2700A121107	1
Klenk	Aniseed	2103311530	1
Klenk	Aniseed	1601211530	1
Klenk	Aniseed	2700A160511	2
Klenk	Aniseed	2700a120320	1
Klenk	Aniseed	2901311530	1
Klenk	Aniseed	3113Q01530	1
Klenk	Aniseed	814Q01530	1
Klenk	Aniseed	212M-01530	1
Klenk	Aniseed	nachprüfung	1
Klenk	Aniseed	2700A150601	2
Klenk	Aniseed	2700A-110701	1
Klenk	Aniseed, pounded	2706B100120	1
Klenk	Aniseed, powdered	2704B110824	1
Klenk	Apple, cut	A120302	3
Klenk	Arnica flower	1181B130605	1
Klenk	Artichoke leaf, cut	B121025	2
Klenk	Artichoke leaf, cut	1981B120413	1
Klenk	Artichoke leaf, cut	1981B130111	3
Klenk	Artichoke leaf, cut	1981B121025	4
Klenk	Ash leaf, cut	5111A-01491	1
Klenk	Asparagus root, cut	6151B100332	1
Klenk	Asplenium scolopendri…	4451B120605	1
Klenk	Asplenium scolopendri…	4451B091116	1
Klenk	Barberry root bark, cut	551B120320	1
Klenk	Barberry root bark, cut	551B110128	6
Klenk	Basil, rubbed	3632a120502	1
Klenk	Basil, rubbed	A110201	1
Klenk	Basil, rubbed	A120502	1
Klenk	Basil, rubbed	3632A120502	5
Klenk	Bean shells, cut	671A-110420	1
Klenk	Bean shells, cut	671A110301	1
Klenk	Bean shells, cut	171A110301	1
Klenk	Bean shells, cut	671C120321	16
Klenk	Bean shells, cut	671C121105	8
Klenk	Bean shells, cut	11030602	6
Klenk	Bean shells, cut	671A100420	1
Klenk	Bean shells, cut	671A100816	2
Klenk	Bean shells, cut	671A110420	12
Klenk	Bean shells, cut	C121105	2
Klenk	Bean shells, cut	C120321	2
Klenk	Bean shells, cut	671C130620	6
Klenk	Bean shells, cut	C130620	1
Klenk	Bearberry leaf, cut	2391b120314	2
Klenk	Bearberry leaf, cut	2391B07030901	1
Klenk	Bearberry leaf, cut	23051202	1
Klenk	Bearberry leaf, cut	2391B120314	9
Klenk	Bearberry leaf, cut	2391B130328	9
Klenk	Bearberry leaf, cut	2391B120719	16
Klenk	Bilberry fruit, dried	2910n120921	1
Klenk	Bilberry fruit, dried	2910n130131	1

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Supplier	Substance	Batch	Spectra
Klenk	Bilberry fruit, dried	2910N121022	8
Klenk	Bilberry fruit, dried	2910A090717	3
Klenk	Bilberry fruit, dried	910N130131	2
Klenk	Bilberry fruit, dried	2910N120921	3
Klenk	Bilberry fruit, dried	2910N130131	11
Klenk	Bilberry fruit, dried	N130131	2
Klenk	Bilberry fruit, dried	N121022	1
Klenk	Bilberry fruit, dried	2910n110304	1
Klenk	Bilberry fruit, dried	2010N110304	1
Klenk	Bilberry leaf, cut	2191N110516	5
Klenk	Bilberry leaf, cut	N110516	1
Klenk	Bilberry leaf, cut	4042013	1
Klenk	Birch leaf, cut	4021409	1
Klenk	Birch leaf, cut	7021307	1
Klenk	Birch leaf, cut	1901A110726	36
Klenk	Birch leaf, cut	1901C120508	23
Klenk	Birch leaf, cut	1901c120508	3
Klenk	Birch leaf, cut	1901A-110726	3
Klenk	Birch leaf, cut	1901A121130	26
Klenk	Birch leaf, cut	C120802	1
Klenk	Birch leaf, cut	27121301	1
Klenk	Birch leaf, cut	F-040413-1	1
Klenk	Birch leaf, cut	28101306	1
Klenk	Birch leaf, cut	4113A-01481	1
Klenk	Birch leaf, cut	A121130	2
Klenk	Birch leaf, cut	4213I01481	1
Klenk	Birch leaf, cut	20111201	1
Klenk	Birch leaf, cut	11101206	1
Klenk	Birch leaf, cut	19121206	1
Klenk	Birch leaf, cut	1901C-120508	1
Klenk	Birch leaf, cut	1901A140214	1
Klenk	Birch leaf, cut	1901A130318	2
Klenk	Birch leaf, cut	1901A05051801	1
Klenk	Birch leaf, cut	1901C12508	1
Klenk	Birch leaf, cut	1901C120802	25
Klenk	Birch leaf, cut	1901A130218	5
Klenk	Birch leaf, cut	1901c120802	1
Klenk	Birch leaf, cut	21061303	1
Klenk	Bitter fennel	2860A150320	5
Klenk	Bitter fennel	2866B100211	1
Klenk	Bitter fennel	2860A140224	2
Klenk	Bitter fennel	2860A140612	10
Klenk	Bitter fennel	2860A150617	2
Klenk	Bitter fennel	2866B130206	1
Klenk	Bitter fennel	2860A140613	1
Klenk	Bitter fennel	2860a120412	3
Klenk	Bitter fennel	2860A130513	2
Klenk	Bitter fennel	2860A140224	1
Klenk	Bitter fennel	2866B110318	2
Klenk	Bitter fennel	2880A100503	2
Klenk	Bitter fennel	2880N120418	4
Klenk	Bitter fennel	3812A-01545	1
Klenk	Bitter fennel	2860A130226	9
Klenk	Bitter fennel	2860,A150617	1
Klenk	Bitter fennel	2860A120412	30
Klenk	Bitter fennel	2860A13	1
Klenk	Bitter orange flower …	1201B120822	1
Klenk	Bitter orange flower …	3613m-01445	1
Klenk	Bitter orange flower …	1201B110809	1
Klenk	Bitter orange peel, cut	B120830	1

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Supplier	Substance	Batch	Spectra
Klenk	Bitter orange peel, cut	3613M-01531	1
Klenk	Bitter orange peel, cut	2711B111207	1
Klenk	Bitter orange peel, cut	C130226	3
Klenk	Bitter orange peel, cut	511B120830	7
Klenk	Bitter orange peel, cut	511C130226	1
Klenk	Bitter orange peel, cut	531A091125	1
Klenk	Bitter orange peel, cut	511B110321	4
Klenk	Bitter orange peel, cut	511c130226	1
Klenk	Black cohosh, cut	6721B1130528	1
Klenk	Black cohosh, cut	6721b130528	1
Klenk	Black cohosh, cut	6721B141202	1
Klenk	Black cohosh, cut	3794377	1
Klenk	Black cohosh, cut	6721B130214	10
Klenk	Black cohosh, cut	6721B081208	1
Klenk	Black cohosh, cut	6721B130528	5
Klenk	Black cohosh, cut	B130528	2
Klenk	Black cumin seed	A120703	1
Klenk	Black cumin seed	7330A120703	1
Klenk	Black mustard seed	7430A120813	2
Klenk	Black mustard seed, p…	7434A120712	1
Klenk	Black mustard seed, p…	7434a150608	1
Klenk	Black mustard seed, p…	7434A130422	3
Klenk	Black mustard seed, p…	A130422	1
Klenk	Black mustard seed, p…	7434A140923	2
Klenk	Black mustard seed, p…	7434A150608	4
Klenk	Black pepper	A130415	2
Klenk	Blackberry leaf, cut	2271B111216	1
Klenk	Blackberry leaf, cut	101364009	1
Klenk	Blackcurrant leaf, cut	22511A110204	1
Klenk	Blackcurrant leaf, cut	2251a110204	1
Klenk	Blackcurrant leaf, cut	2251A110204	4
Klenk	Blackcurrants	2990A110620	1
Klenk	Blackcurrants	A121106	1
Klenk	Blackthorn flower	2612E-01468	1
Klenk	Blackthorn flower, ru…	1150n101109	1
Klenk	Blackthorn flower, ru…	1150N101109	3
Klenk	Blessed thistle, cut	nachprüfung	1
Klenk	Blessed thistle, cut	A110517	1
Klenk	Blue bottle flower wi…		1
Klenk	Bogbean leaf, cut	2371A100915	1
Klenk	Bogbean leaf, cut	2371A110809	3
Klenk	Boldo leaf, cut	1911B090709	1
Klenk	Boldo leaf, cut	1911A100714	8
Klenk	Buckwheat herb, cut	4581B120509	3
Klenk	Burdock root, cut	6161A-120103	1
Klenk	Burdock root, cut	6161A080709	1
Klenk	Burdock root, cut	6161A120103	1
Klenk	Burdock root, cut	6161A120208	3
Klenk	Burdock root, cut	6161A-101206	1
Klenk	Burdock root, cut	6161A101206	3
Klenk	Burdock root, cut	6161a120103	1
Klenk	Burdock root, cut	A130214	1
Klenk	Burdock root, cut	A120206	1
Klenk	Calendula flower	1241B130517	1
Klenk	Calendula flower	C120321	1
Klenk	Calendula flower	1241B120312	1
Klenk	Calendula flower	1250A110511	1
Klenk	Calendula flower, cut	1241B140211	1
Klenk	Calendula flower, cut	1241B150902	1
Klenk	Calendula flower, cut	B130517	2

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Supplier	Substance	Batch	Spectra
Klenk	Calendula flower, cut	1241N151209	1
Klenk	Calendula flower, cut	2000234	1
Klenk	Calendula flower, cut	3013E1448	1
Klenk	Calendula flower, cut	1241B160530	1
Klenk	Calendula flower, cut	1241B130927	1
Klenk	Calendula flower, cut	204311448	1
Klenk	Calendula flower, cut	1241B120419	3
Klenk	Calendula flower, cut	1240A110418	2
Klenk	Calendula flower, cut	1241B110118	2
Klenk	Calendula flower, cut	112211448	1
Klenk	Calendula flower, cut	1241B130321	6
Klenk	Caraway fruit	2770A140708	2
Klenk	Caraway fruit	2770A120403	16
Klenk	Caraway fruit	2770A130521	12
Klenk	Caraway fruit	2770a120905	2
Klenk	Caraway fruit	2770A110818	8
Klenk	Caraway fruit	412091-1-P	1
Klenk	Caraway fruit	3712I-1537	1
Klenk	Caraway fruit	2770A131008	4
Klenk	Caraway fruit	A120905	3
Klenk	Caraway fruit	2770A110601	16
Klenk	Caraway fruit	5213A1537	1
Klenk	Caraway fruit	2770A130910	1
Klenk	Caraway fruit	2770A120905	8
Klenk	Caraway fruit	nachprüfung	2
Klenk	Caraway fruit	1810A-01537	1
Klenk	Caraway fruit	2270A130521	1
Klenk	Cardamom fruit	2750A110810	2
Klenk	Cardamom fruit	A110810	3
Klenk	Cardamom fruit	A130807	1
Klenk	Centaury, cut	B120628	1
Klenk	Centaury, cut	3711B-111216	1
Klenk	Centaury, cut	3711B111216	2
Klenk	Ceylon cinnamon, fine…	611B100628	1
Klenk	Ceylon cinnamon, fine…	615B130325	3
Klenk	Ceylon cinnamon, fine…	614a120411	1
Klenk	Ceylon cinnamon, fine…	614b121024	1
Klenk	Ceylon cinnamon, fine…	614B120411	2
Klenk	Ceylon cinnamon, fine…	614B150422	1
Klenk	Ceylon cinnamon, fine…	614B151008	2
Klenk	Ceylon cinnamon, fine…	614B121010	2
Klenk	Ceylon cinnamon, fine…	614B121024	4
Klenk	Chelidonium majus her…	3731A130904	4
Klenk	Chelidonium majus her…	4711E-01632	1
Klenk	Chelidonium majus her…	nachprüfung	1
Klenk	Chelidonium majus her…	3731K120904	5
Klenk	Chelidonium majus her…	3731A110301	12
Klenk	Chelidonium majus her…	3731B100205	1
Klenk	Chelidonium majus her…	1406111632	1
Klenk	Chelidonium majus her…	3731A120611	6
Klenk	Chelidonium majus her…	3731A-110301	1
Klenk	Chickweed, cut	4551b110222	1
Klenk	Chickweed, cut	4551B090528	1
Klenk	Chicory herb, cut	3751A080902	1
Klenk	Chicory herb, cut	3751A120123	4
Klenk	Chicory herb, cut	3751A-100118	1
Klenk	Chicory herb, cut	3751a120307	1
Klenk	Chicory herb, cut	3751c120614	1
Klenk	Chicory herb, cut	4510I-01634	1
Klenk	Chicory herb, cut	A120123	2

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Supplier	Substance	Batch	Spectra
Klenk	Chicory herb, cut	3751A120307	6
Klenk	Chicory herb, cut	3751A100118	1
Klenk	Chicory root, cut	6221A090311	2
Klenk	Chicory root, cut	66221A101202	1
Klenk	Chicory root, cut	6221N130201	1
Klenk	Chicory root, cut	A130304	1
Klenk	Chicory root, cut	6221A130304	1
Klenk	Chicory root, cut	6221A101202	6
Klenk	Cinchona bark, cut	601B130415	1
Klenk	Cinchona bark, cut	601B130415	1
Klenk	Cinnamon rods (Ceylon…	A101018	1
Klenk	Cinnamon rods (Ceylon…	610A101018	1
Klenk	Cinnamon rods (Ceylon…	B121016	1
Klenk	Cinnamon, cut	610A101018	1
Klenk	Cinnamon, cut	610A130927	1
Klenk	Clove	1260A130903	3
Klenk	Clove	A120328	1
Klenk	Clove	1260A120328	6
Klenk	Clove	1260A150304	2
Klenk	Clove	1260A100617	2
Klenk	Clove	1260A101223	2
Klenk	Clove	1260A110608	6
Klenk	Clove	pzn03485222	1
Klenk	Clove	pzn3485222	1
Klenk	Clove	PZN03485222	1
Klenk	Coltsfoot leaf, cut	11101202	1
Klenk	Coltsfoot leaf, cut	14111302	1
Klenk	Coltsfoot leaf, cut	2021B140131	2
Klenk	Coltsfoot leaf, cut	KS100061	1
Klenk	Coltsfoot leaf, cut	2020B120124	1
Klenk	Coltsfoot leaf, cut	2021B111111	5
Klenk	Coltsfoot leaf, cut	8061207	1
Klenk	Coltsfoot leaf, cut	2021B120601	5
Klenk	Coltsfoot leaf, cut	B120124	1
Klenk	Coltsfoot leaf, cut	2021B121203	6
Klenk	Coltsfoot leaf, cut	2012B120124	1
Klenk	Coltsfoot leaf, cut	5122013a	1
Klenk	Coltsfoot leaf, cut	20021301	1
Klenk	Coltsfoot leaf, cut	2021B150407	1
Klenk	Coltsfoot leaf, cut	2021B130319	6
Klenk	Coltsfoot leaf, cut	23121302	1
Klenk	Coltsfoot leaf, cut	2021C130326	12
Klenk	Coltsfoot leaf, cut	26091301	1
Klenk	Coltsfoot leaf, cut	B130227	1
Klenk	Coltsfoot leaf, cut	2021C140730	2
Klenk	Coltsfoot leaf, cut	2021b121204	1
Klenk	Coltsfoot leaf, cut	5011301	1
Klenk	Coltsfoot leaf, cut	2021B111005	2
Klenk	Comfrey herb, cut	4561B100518	2
Klenk	Comfrey root	6241B110811	1
Klenk	Comfrey root	6241B100715	1
Klenk	Comfrey root	B130619	1
Klenk	Comfrey root	6241B120531	4
Klenk	Comfrey root	6241B130312	3
Klenk	Comfrey root	6241B130619	8
Klenk	Comfrey root	6241B06110202	1
Klenk	Comfrey root	6241b120807	1
Klenk	Comfrey root	6241B131009	1
Klenk	Comfrey root	6241B121214	2
Klenk	Comfrey root	6241b130724	2

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Supplier	Substance	Batch	Spectra
Klenk	Comfrey root	6241B130724	7
Klenk	Comfrey root	6244B130624	1
Klenk	Comfrey root	6241b130619	1
Klenk	Comfrey root	6241B120807	4
Klenk	Common wormwood herb,...	3591A120123	7
Klenk	Common wormwood herb,...	A120123	2
Klenk	Common wormwood herb,...	3591a120123	1
Klenk	Common wormwood herb,...	3591A11119	1
Klenk	Common wormwood herb,...	3591A130218	9
Klenk	Common wormwood herb,...	2591A130218	1
Klenk	Common wormwood herb,...	12016707	5
Klenk	Common wormwood herb,...	3591a130218	2
Klenk	Common wormwood herb,...	12016708	6
Klenk	Common wormwood herb,...	7312754	1
Klenk	Coriander	2790A121023	9
Klenk	Coriander	A121023	3
Klenk	Coriander	2790a121023	1
Klenk	Coriander	2790A130129	2
Klenk	Coriander	2790A151117	1
Klenk	Coriander	2709A130129	1
Klenk	Cottonwood bud	3260A120828	1
Klenk	Couch grass rhizome, ...	6781N111019	1
Klenk	Cowberry leaf, cut	2431B101006	2
Klenk	Daisy flower	1210A110223	1
Klenk	Daisy flower	A130705	1
Klenk	Daisy flower	1210A120215	5
Klenk	Daisy flower	1210a071301	1
Klenk	Damiana leaf, cut	A130206	2
Klenk	Damiana leaf, cut	12064101	1
Klenk	Damiana leaf, cut	1990A130206	1
Klenk	Dandelion herb with r...	6611A110104	1
Klenk	Dandelion herb with r...	6611B110104	7
Klenk	Dandelion herb with r...	6611B-131206	1
Klenk	Dandelion herb with r...	6611B110929	3
Klenk	Dandelion herb with r...	6611B-120620	1
Klenk	Dandelion herb with r...	6611b130321	1
Klenk	Dandelion herb with r...	6611B420620	1
Klenk	Dandelion herb with r...	6611B1104104	1
Klenk	Dandelion herb with r...	6611B090306	1
Klenk	Dandelion herb with r...	6611B130314	4
Klenk	Dandelion herb with r...	6611b131206	1
Klenk	Dandelion herb with r...	6611B160613	1
Klenk	Dandelion herb with r...	6611b110929	2
Klenk	Dandelion herb with r...	5122013b	1
Klenk	Dandelion root, cut	N130813	1
Klenk	Dandelion root, cut	4513A-07035	1
Klenk	Dandelion root, cut	6621A120208	10
Klenk	Dandelion root, cut	6621A110420	5
Klenk	Dandelion root, cut	6621A160111	1
Klenk	Dandelion root, cut	6621A141027	3
Klenk	Dandelion root, cut	6621N130813	8
Klenk	Dandelion root, cut	6621B151029	1
Klenk	Dandelion root, cut	6621A140114	3
Klenk	Dandelion root, cut	A120606	1
Klenk	Dandelion root, cut	6621A140114	4
Klenk	Dandelion root, cut	6621A120606	23
Klenk	Dandelion root, cut	6101202	1
Klenk	Devil's claw root	6331B130129	5
Klenk	Devil's claw root	6331B120508	4
Klenk	Devil's claw root	10111204	1

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Supplier	Substance	Batch	Spectra
Klenk	Dill fruit	A120312	1
Klenk	Dill fruit	2680a120312	1
Klenk	Dill fruit	2680A-120312	1
Klenk	Dill fruit	2680A120312	8
Klenk	Dill fruit	2680A130806	1
Klenk	Dill herb, cut	3531B110726	1
Klenk	Elder flower, rubbed	1571A130930	3
Klenk	Elder flower, rubbed	1571A130627	2
Klenk	Elder flower, rubbed	1571A121022	19
Klenk	Elder flower, rubbed	1571A-110223	1
Klenk	Elder flower, rubbed	1571A120215	8
Klenk	Elder flower, rubbed	A120215	1
Klenk	Elder flower, rubbed	1021304	1
Klenk	Elder flower, rubbed	1901211471	1
Klenk	Elder flower, rubbed	A121121	1
Klenk	Elder flower, rubbed	1571A110125	4
Klenk	Elder flower, rubbed	13021301	1
Klenk	Elder flower, rubbed	1571a120215	1
Klenk	Elder flower, rubbed	1571A110223	20
Klenk	Elder flower, rubbed	21091201	1
Klenk	Elder flower, rubbed	1571A141126	1
Klenk	Elder flower, rubbed	1571a121121	2
Klenk	Elder flower, rubbed	1571a1211	1
Klenk	Elder flower, rubbed	1571A121121	24
Klenk	Elder flower, rubbed	16061201	1
Klenk	Elder flower, rubbed	1571a121022	3
Klenk	Elder flower, rubbed	157A120215	1
Klenk	Elder flower, rubbed	26061201	1
Klenk	Elder root, cut	6281B110427	4
Klenk	Elecampane rhizome, cut	6341B100426	4
Klenk	Elecampane rhizome, cut	B130423	3
Klenk	Elecampane rhizome, cut	6341B130423	3
Klenk	Elecampane rhizome, cut	6311141B130423	1
Klenk	Elecampane rhizome, cut	6341B120611	2
Klenk	Eleutherococcus, cut	7011A101206	1
Klenk	Eleutherococcus, cut	7011A121204	1
Klenk	Eleutherococcus, cut	7011A110714	1
Klenk	Elm bark, cut	841A1101120	1
Klenk	Elm bark, cut	841a120413	1
Klenk	Equisetum stem, cut	3831A111124	8
Klenk	Equisetum stem, cut	3831A120529	13
Klenk	Equisetum stem, cut	3831C131104	1
Klenk	Equisetum stem, cut	2213U01642	1
Klenk	Equisetum stem, cut	3831c131104	1
Klenk	Equisetum stem, cut	3831A-120726	1
Klenk	Equisetum stem, cut	3831a120611	1
Klenk	Equisetum stem, cut	3831A120018	1
Klenk	Equisetum stem, cut	3831A11124	1
Klenk	Equisetum stem, cut	3831A110601	2
Klenk	Equisetum stem, cut	4413Q1642	1
Klenk	Equisetum stem, cut	4713U01642	1
Klenk	Equisetum stem, cut	3831A110922	2
Klenk	Equisetum stem, cut	3831A120903	8
Klenk	Equisetum stem, cut	1804211642	1
Klenk	Equisetum stem, cut	3831A120726	22
Klenk	Equisetum stem, cut	3831A121018	6
Klenk	Equisetum stem, cut	3831N110218	1
Klenk	Equisetum stem, cut	3831A1230726	1
Klenk	Equisetum stem, cut	3831A120611	12
Klenk	Eucalyptus leaf, cut	B120419	1

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Supplier	Substance	Batch	Spectra
Klenk	Eucalyptus leaf, cut	2011B110801	4
Klenk	Eucalyptus leaf, cut	2011B120419	5
Klenk	Eucalyptus leaf, cut	2011B130306-35294110	1
Klenk	Eucalyptus leaf, cut	2011b130306	1
Klenk	Eucalyptus leaf, cut	B130306	2
Klenk	Eucalyptus leaf, cut	2011B130306	4
Klenk	Euphrasy herb, cut	B130430	1
Klenk	Euphrasy herb, cut	B101206	1
Klenk	Euphrasy herb, cut	3871B130430	1
Klenk	Euphrasy herb, cut	3871B100713	1
Klenk	Euphrasy herb, cut	15029806	1
Klenk	European golden rod, ...	1781B110706	2
Klenk	Fenugreek	7260A120118	25
Klenk	Fenugreek	7260A130603	12
Klenk	Fenugreek	7260A110530	19
Klenk	Fenugreek	9011301	1
Klenk	Fenugreek	8061301	1
Klenk	Fenugreek	A130603	1
Klenk	Fenugreek, powdered	12082014A	1
Klenk	Fenugreek, powdered	7264A110201	9
Klenk	Fenugreek, powdered	A110201	1
Klenk	Feverfew herb, cut	4831B110819	2
Klenk	Flax weed herb, cut	4011B131115	3
Klenk	Flax weed herb, cut	4011B121207	2
Klenk	Frangula bark, cut	6621B110412	1
Klenk	Frangula bark, cut	pzn4266611	1
Klenk	Frangula bark, cut	661B130306	1
Klenk	Frangula bark, cut	661B-110412	1
Klenk	Frangula bark, cut	nachprüfung	1
Klenk	Frangula bark, cut	661B-090903	1
Klenk	Fraxinella root, cut	6271B140708	1
Klenk	Fumitory, cut	B120410	1
Klenk	Galeopsis herb, cut	3911A080409	1
Klenk	Galeopsis herb, cut	3911a130320	2
Klenk	Galeopsis herb, cut	3911A130110	3
Klenk	Galeopsis herb, cut	3911A090219	2
Klenk	Gentian root, cut	6311B140704	1
Klenk	Gentian root, cut	6311B130205	2
Klenk	Gentian root, cut	1911E-02142	1
Klenk	Gentian root, cut	6311A120723	4
Klenk	Gentian root, cut	6311B100817	2
Klenk	Gentian root, cut	6311B110509	1
Klenk	Gentian root, cut	6311a120723	2
Klenk	Geum urbanum herb, cut	3931B080714	2
Klenk	Ginger, peeled	6951B100302	1
Klenk	Ginger, peeled	6951B130110	1
Klenk	Ginger, peeled	6951B110822	2
Klenk	Ginger, peeled	6951B110119	1
Klenk	Ginger, peeled, powde...	6954B160429	5
Klenk	Ginger, peeled, powde...	6954B160929	2
Klenk	Ginger, peeled, powde...	6954B110801	1
Klenk	Ginger, peeled, powde...	6954B121030	2
Klenk	Ginger, peeled, powde...	6954B130418	2
Klenk	Ginger, peeled, powde...	B121030	2
Klenk	Ginger, peeled, powde...	KS200260	1
Klenk	Ginkgo leaf, cut	2461A100429	10
Klenk	Ginkgo leaf, cut	2461B111108	1
Klenk	Goat's rue, cut	3901B140801	1
Klenk	Goat's rue, cut	3901C110905	1
Klenk	Ground ivy herb, cut	11052317	1

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Supplier	Substance	Batch	Spectra
Klenk	Ground ivy herb, cut	3991B110304	3
Klenk	Ground ivy herb, cut	3991B130502	2
Klenk	Hamamelis leaf, cut	B110214	1
Klenk	Hamamelis leaf, cut	2051B110214	1
Klenk	Hawthorn flower	1351B130819	3
Klenk	Hawthorn flower	B1112107	1
Klenk	Hawthorn fruit	2806B121203	2
Klenk	Hawthorn fruit	2806B110818	2
Klenk	Hawthorn leaf with fl…	20121302	1
Klenk	Hawthorn leaf with fl…	1971A130307-3447	1
Klenk	Hawthorn leaf with fl…	1971a120813	2
Klenk	Hawthorn leaf with fl…	1972A120727	1
Klenk	Hawthorn leaf with fl…	1971A120813-34103101	1
Klenk	Hawthorn leaf with fl…	14101301	1
Klenk	Hawthorn leaf with fl…	28101307	1
Klenk	Hawthorn leaf with fl…	1971A130307-35014110	1
Klenk	Hawthorn leaf with fl…	A130307	1
Klenk	Hawthorn leaf with fl…	1971A120727	14
Klenk	Hawthorn leaf with fl…	1971a120215	1
Klenk	Hawthorn leaf with fl…	1971A110620	7
Klenk	Hawthorn leaf with fl…	1971A120813	26
Klenk	Hawthorn leaf with fl…	1971a120727	1
Klenk	Hay flower	A130304	1
Klenk	Hay flower	1400A120116	1
Klenk	Hay flower	10192103	1
Klenk	Heather flower, rubbed	13014202	1
Klenk	Henna powder	2074A111004	1
Klenk	Henna powder	20747A111004	1
Klenk	Hop strobile	B130409	1
Klenk	Hop strobile	1450A110712	1
Klenk	Hop strobile	1451B130409	1
Klenk	Hop strobile	12008304	1
Klenk	Hop strobile	1451B120817	12
Klenk	Hop strobile	1451B111004	2
Klenk	Hop strobile	1451B-120817	1
Klenk	Hop strobile	1451b130107	1
Klenk	Hop strobile	1451b130409	1
Klenk	Hop strobile	1451B140408	2
Klenk	Hop strobile	20071301	1
Klenk	Hop strobile	4301135	1
Klenk	Hop strobile	1451B130107	6
Klenk	Horse chestnut flower…	1440A110311	3
Klenk	Horse chestnut leaf, …	2551N130124	3
Klenk	Horse chestnut leaf, …	N130124	2
Klenk	Horse chestnut leaf, …	2551B081223	1
Klenk	Horse chestnut leaf, …	2551B111013	9
Klenk	Horse chestnut leaf, …	255100903	1
Klenk	Iceland moss, cut	5191A140828	1
Klenk	Iceland moss, cut	5191N110609	1
Klenk	Ispaghula seed	7560A130418	2
Klenk	Ispaghula seed	7560A140203	4
Klenk	Ispaghula seed	7560A150420	3
Klenk	Ispaghula seed	20071302	1
Klenk	Ispaghula seed	7560A120330	1
Klenk	Ispaghula seed	7560A120828	8
Klenk	Ispaghula seed	7560A130710	1
Klenk	Ivy leaf, cut	B130118	1
Klenk	Jasmine flower	1460A110505	1
Klenk	Java tea, cut	B110718	1
Klenk	Java tea, cut	B121112	3

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Supplier	Substance	Batch	Spectra
Klenk	Java tea, cut	2221B12112	1
Klenk	Java tea, cut	2221B110718	11
Klenk	Java tea, cut	221B121112	1
Klenk	Java tea, cut	17121304	1
Klenk	Juniper	A120709	3
Klenk	Juniper	2890A100120	2
Klenk	Juniper	2890A130513	2
Klenk	Juniper	2890A101201	8
Klenk	Juniper	2890a120709	1
Klenk	Juniper, pounded	2896B121016	7
Klenk	Kaolin, heavy	424A130507	2
Klenk	Kaolin, heavy	424A100819	2
Klenk	Kaolin, heavy	424A130507	4
Klenk	Kaolin, heavy	45131I01190	1
Klenk	Kelp, cut	1051A110920	1
Klenk	Knotgrass, cut	4301A121120	3
Klenk	Knotgrass, cut	4301A120912	2
Klenk	Knotgrass, cut	140713a	1
Klenk	Ladys bedstraw herb,...	3921C120802	1
Klenk	Ladys bedstraw herb,...	3921C130226	1
Klenk	Ladys bedstraw herb,...	3921B12030	1
Klenk	Ladys bedstraw herb,...	3921B101012	1
Klenk	Lapacho wood, cut	13298302	1
Klenk	Large waybread herb, ...	N111121	1
Klenk	Large waybread herb, ...	4281N110404	1
Klenk	Large waybread herb, ...	4281N111121	5
Klenk	Laurel leaf	B110809	1
Klenk	Laurel leaf, cut	B110809	2
Klenk	Lavender flower	1489A120919	8
Klenk	Lavender flower	1489A100125	1
Klenk	Lavender flower	1489A1203	1
Klenk	Lavender flower	313U-01462	1
Klenk	Lavender flower	1488B130604	6
Klenk	Lavender flower	1488A120803	3
Klenk	Lavender flower	1488B130111	2
Klenk	Lavender flower	1489A1209019	1
Klenk	Lavender flower	1802211462	1
Klenk	Lavender flower	1488A111201	2
Klenk	Lavender flower	1137903	1
Klenk	Lemon grass, cut	7721A120906	1
Klenk	Lemon grass, cut	A130907	1
Klenk	Lemon grass, cut	A120906	1
Klenk	Lemon grass, cut	7721A130708	1
Klenk	Lemon peel, cut	A130221	3
Klenk	Lemon peel, cut	B130521	1
Klenk	Lemon peel, cut	621A091016	3
Klenk	Lemon peel, cut	621A130221	1
Klenk	Lemon verbena leaf, cut	2411B110408	2
Klenk	Lime flower, cut	1611b121105	1
Klenk	Lime flower, cut	1611B110421	2
Klenk	Lime flower, cut	Pr.Nr.4411A-01474	1
Klenk	Lime flower, cut	1611A121120	11
Klenk	Lime flower, cut	1611B121105	6
Klenk	Lime flower, cut	1611B1010004	1
Klenk	Lime flower, cut	1611B130307	3
Klenk	Lime flower, cut	1611B130905	5
Klenk	Lime flower, cut	1611B11011	1
Klenk	Lime flower, cut	1611B111011	7
Klenk	Lime flower, cut	B130307	2
Klenk	Lime flower, cut	1611A12110	1

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Supplier	Substance	Batch	Spectra
Klenk	Lime flower, cut	1611a121120	2
Klenk	Lime flower, cut	B130905	4
Klenk	Lime flower, cut	1611B131220	1
Klenk	Lime leaf, cut	2471B120502	1
Klenk	Linseed	1910212240	1
Klenk	Linseed	7300A130722	9
Klenk	Linseed	7300A141201	3
Klenk	Linseed	7308A130110	5
Klenk	Linseed	7307A140605	1
Klenk	Linseed	7307A140526	3
Klenk	Linseed	7307A160414	1
Klenk	Linseed	5615003	1
Klenk	Linseed	7300A111107	6
Klenk	Linseed	7300a130110	1
Klenk	Linseed	3707A140526	1
Klenk	Linseed	7308A111107	5
Klenk	Linseed	7308A100705	1
Klenk	Linseed	A130110	1
Klenk	Linseed	7397A140605	1
Klenk	Linseed	7300A100705	2
Klenk	Linseed	7300A130110	9
Klenk	Linseed	7307A130124	2
Klenk	Linseed	7307A121212	2
Klenk	Linseed	2002285	1
Klenk	Linseed	7500A140556	1
Klenk	Linseed	7308A150710	2
Klenk	Linseed	1913Q-02240	1
Klenk	Linseed	7307A131021	1
Klenk	Linseed	7307A131104	14
Klenk	Linseed	7307A-130110	1
Klenk	Linseed	7307a111107	1
Klenk	Linseed	7307A150710	5
Klenk	Linseed	7307A-130722	1
Klenk	Linseed	7307A141201	6
Klenk	Linseed	7307a131104	1
Klenk	Linseed	7307A130110	18
Klenk	Linseed	737A130722	1
Klenk	Linseed	903312240	1
Klenk	Linseed	7307A130722	7
Klenk	Linseed	7307A170111	1
Klenk	Liqourice root, peeled	6381a121126	1
Klenk	Liqourice root, peeled	6381A130820	7
Klenk	Liqourice root, peeled	6381A111004	17
Klenk	Liqourice root, peeled	6281a120611	1
Klenk	Liqourice root, peeled	6381a111004	1
Klenk	Liqourice root, peeled	6381A120806	5
Klenk	Liqourice root, peeled	6381A140109	2
Klenk	Liqourice root, peeled	A130426	1
Klenk	Liqourice root, peeled	6381A121126	36
Klenk	Liqourice root, peeled	638A130820	1
Klenk	Liqourice root, peeled	6381111A121126	1
Klenk	Liqourice root, peeled	6381A120611	16
Klenk	Liqourice root, peeled	6381a120611	1
Klenk	Liqourice root, peeled	6381A110531	2
Klenk	Liqourice root, peeled	A130820	3
Klenk	Liqourice root, peeled	6381A130426	22
Klenk	Liquorice root, natur…	6390A101020	1
Klenk	Liquorice root, natur…	6391A080905	5
Klenk	Liquorice root, natur…	6391A110421	4
Klenk	Lovage root, cut	B121029	1

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Supplier	Substance	Batch	Spectra
Klenk	Lovage root, cut	6371A080508	5
Klenk	Lovage root, cut	6371B-121029	1
Klenk	Lovage root, cut	6371b121029	2
Klenk	Lovage root, cut	B110228	1
Klenk	Lovage root, cut	6371B121029	3
Klenk	Lungwort herb, cut	4331B111205	2
Klenk	Lungwort herb, cut	4331A120813	1
Klenk	Lycopodium herb, cut	4111B110428	2
Klenk	Maize style, cut	5581A081204	1
Klenk	Maize style, cut	A110411	1
Klenk	Maize style, cut	5581A111206	1
Klenk	Male speedwell wort, …	6661C130226	1
Klenk	Male speedwell wort, …	4661A090318	1
Klenk	Male speedwell wort, …	4661C2004	1
Klenk	Male speedwell wort, …	4661B101011	1
Klenk	Male speedwell wort, …	4661c130226-34343111	1
Klenk	Male speedwell wort, …	4661C130226-32743106	1
Klenk	Male speedwell wort, …	4661c120802	1
Klenk	Male speedwell wort, …	4661c120321	1
Klenk	Male speedwell wort, …	4661C120802	14
Klenk	Male speedwell wort, …	4661C111011	20
Klenk	Male speedwell wort, …	4661B110916	2
Klenk	Male speedwell wort, …	4661C13026	1
Klenk	Male speedwell wort, …	4661C130226	30
Klenk	Male speedwell wort, …	C120321	1
Klenk	Male speedwell wort, …	nachprüfung	1
Klenk	Male speedwell wort, …	4661C-111011	1
Klenk	Male speedwell wort, …	4661C131104	1
Klenk	Mallow flower, cut	B130829	3
Klenk	Mallow flower, cut	B120427	1
Klenk	Mallow flower, cut	1501B130829	3
Klenk	Mallow flower, cut	1910211464	1
Klenk	Mallow flower, cut	1501B110207	2
Klenk	Mallow flower, cut	1501B120508	6
Klenk	Mallow flower, cut	150B111215	1
Klenk	Mallow flower, cut	1501B120427	11
Klenk	Mallow flower, cut	1501B100408	1
Klenk	Mallow flower, cut	1501b110207	1
Klenk	Mallow flower, cut	1501B-120427	1
Klenk	Mallow flower, cut	1501b111215	1
Klenk	Mallow leaf, cut	2131B110420	4
Klenk	Mallow leaf, cut	2131B130225	4
Klenk	Mallow leaf, cut	2131B120529	7
Klenk	Mallow leaf, cut	2131B10529	1
Klenk	Mallow leaf, cut	B130225	1
Klenk	Manna, cut	5221A150107	1
Klenk	Manna, cut	5221A120509	10
Klenk	Manna, cut	5221A110314	1
Klenk	Manna, cut	5221A140210	4
Klenk	Marian thistle fruit	A120725	1
Klenk	Marian thistle fruit	6621A120606	1
Klenk	Marian thistle fruit	7180A090929	1
Klenk	Marian thistle fruit	7180A120207	2
Klenk	Marian thistle fruit	7180A120725	3
Klenk	Marian thistle fruit	70180A120725	1
Klenk	Marian thistle fruit	7180A130219	2
Klenk	Marian thistle fruit	7180A132019	1
Klenk	Marian thistle herb, …	3701B111117	1
Klenk	Marian thistle herb, …	3701a111207	1
Klenk	Marian thistle herb, …	2011402	1

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Supplier	Substance	Batch	Spectra
Klenk	Marian thistle herb, ...	3701A100916	2
Klenk	Marian thistle herb, ...	913E-01627	1
Klenk	Marian thistle herb, ...	11041310	1
Klenk	Marian thistle herb, ...	3701B110610	1
Klenk	Marian thistle herb, ...	B110728	1
Klenk	Marian thistle herb, ...	3701A111207	12
Klenk	Marian thistle herb, ...	3701B130318	6
Klenk	Marjoram herb, rubbed	4881a101025	1
Klenk	Marjoram herb, rubbed	4881A101025	17
Klenk	Marjoram herb, rubbed	A101025	2
Klenk	Marjoram herb, rubbed	ohne	1
Klenk	Marjoram herb, rubbed	4881A1311105	1
Klenk	Marjoram herb, rubbed	12345678	1
Klenk	Marjoram herb, rubbed	4881A091119	1
Klenk	Marrubium vulgare her...	4141A130110	1
Klenk	Marrubium vulgare her...	13289102	1
Klenk	Marshmallow root, pee...	6071B110329	1
Klenk	Marshmallow root, pee...	6074B100416	1
Klenk	Marshmallow root, pee...	6071a130408	1
Klenk	Marshmallow root, pee...	6071B090311	1
Klenk	Marshmallow root, pee...	A130408	3
Klenk	Marshmallow root, pee...	8120	1
Klenk	Marshmallow root, pee...	130116	1
Klenk	Marshmallow root, pee...	6071A120314	18
Klenk	Marshmallow root, pee...	6071A120306	1
Klenk	Marshmallow root, pee...	6071A-120314	1
Klenk	Marshmallow root, pee...	6071A120306	4
Klenk	Marshmallow root, pee...	6071B091207	1
Klenk	Maté leaf, cut	2131A111213	1
Klenk	Maté leaf, cut	2141A120821	3
Klenk	Maté leaf, cut	2141A-101102	1
Klenk	Matricaria flower	27111204	1
Klenk	Matricaria flower	1290B101122	1
Klenk	Matricaria flower	2701211452	1
Klenk	Matricaria flower	129A120620	1
Klenk	Matricaria flower	A120529	1
Klenk	Matricaria flower	1290A20404	1
Klenk	Matricaria flower	1290A120404	1
Klenk	Matricaria flower	11101302	1
Klenk	Matricaria flower	A130502	1
Klenk	Matricaria flower	1290A110607	3
Klenk	Matricaria flower	1290A110825	3
Klenk	Matricaria flower	1290A140508	1
Klenk	Matricaria flower	1290A120404	11
Klenk	Matricaria flower	1290A12061	1
Klenk	Matricaria flower	1290B140624	1
Klenk	Matricaria flower	1290B140123	2
Klenk	Matricaria flower	1290A120601	2
Klenk	Matricaria flower	1290B130415	4
Klenk	Matricaria flower	1290a120620	1
Klenk	Matricaria flower	1290A150618	1
Klenk	Matricaria flower	1290A110421	1
Klenk	Matricaria flower	1290A120601	15
Klenk	Matricaria flower	1290B130415	42
Klenk	Matricaria flower	B130415	2
Klenk	Matricaria flower	1290A120529	4
Klenk	Matricaria flower	1290A120620	20
Klenk	Matricaria flower	1290A130516	9
Klenk	Matricaria flower	1290A120529	1
Klenk	Matricaria flower	1290A130516	3

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Supplier	Substance	Batch	Spectra
Klenk	Matricaria flower	4100113002	2
Klenk	Matricaria flower	1290A130502	1
Klenk	Matricaria flower	1290A130502	1
Klenk	Matricaria flower	1290A-120620	1
Klenk	Matricaria flower	16121301	1
Klenk	Matricaria flower	27111209	1
Klenk	Matricaria flower	14111314	1
Klenk	Matricaria flower	A130516	1
Klenk	Matricaria flower	A120529	1
Klenk	Matricaria flower	2310211452	1
Klenk	Matricaria flower	1290B140123	2
Klenk	Meadowsweet flower, r…	1581A090713	1
Klenk	Meadowsweet flower, r…	ChB:1581a120312	1
Klenk	Meadowsweet flower, r…	A120312	1
Klenk	Meadowsweet herb, cut	4541A120313	2
Klenk	Melilot herb, cut	4151A120912	2
Klenk	Melissa leaf, cut	2161A130806	4
Klenk	Melissa leaf, cut	2161A101216	1
Klenk	Melissa leaf, cut	2161A120718	17
Klenk	Melissa leaf, cut	2807211503	1
Klenk	Melissa leaf, cut	2161A111207	21
Klenk	Melissa leaf, cut	111207	1
Klenk	Melissa leaf, cut	2161A110207	1
Klenk	Melissa leaf, cut	2161A121009/PN:1198	1
Klenk	Melissa leaf, cut	2161a111207	2
Klenk	Melissa leaf, cut	2161A121009	15
Klenk	Melissa leaf, cut	2161A121029	6
Klenk	Melissa leaf, cut	2161A121206	3
Klenk	Melissa leaf, cut	2161A110818	1
Klenk	Melissa leaf, cut	27091201	1
Klenk	Melissa leaf, cut	2161A151209	1
Klenk	Mistletoe, cut	4691A-120507	1
Klenk	Mistletoe, cut	4691A121122	12
Klenk	Mistletoe, cut	4691a110816	1
Klenk	Mistletoe, cut	4691A110816	2
Klenk	Mistletoe, cut	4691A120419	9
Klenk	Mistletoe, cut	1512211695	1
Klenk	Mistletoe, cut	4691a121122	1
Klenk	Mistletoe, cut	2901311695	1
Klenk	Mistletoe, cut	4691A720507	1
Klenk	Mistletoe, cut	4961A120419	2
Klenk	Mistletoe, cut	110816	1
Klenk	Mistletoe, cut	4691A121122-35454110	1
Klenk	Mistletoe, cut	4691A120507	3
Klenk	Mistletoe, cut	603211695	1
Klenk	Mistletoe, cut	4691a130307	2
Klenk	Mistletoe, cut	4691A130307	7
Klenk	Motherwort herb, cut	4071A-100707	1
Klenk	Mullein flower, cut	1651B110915	1
Klenk	Mullein flower, cut	A120612	1
Klenk	Mullein flower, cut	3951B121218	1
Klenk	Mullein flower, cut	1651B121109	22
Klenk	Mullein flower, cut	1651b120315	1
Klenk	Mullein flower, cut	1651b130820	2
Klenk	Mullein flower, cut	15651B121109	1
Klenk	Mullein flower, cut	1650A100608	1
Klenk	Mullein flower, cut	1651B130820	5
Klenk	Mullein flower, cut	1651B120315	6
Klenk	Mullein flower, cut	1650A120612	1
Klenk	Mullein flower, cut	1651B110203	2

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Supplier	Substance	Batch	Spectra
Klenk	Mullein flower, cut	1650A111018	3
Klenk	Mullein flower, cut	1651B150722	1
Klenk	Mullein flower, cut	1651B140324	2
Klenk	Myrrh	3351A120514	1
Klenk	Myrrh	3351A130902	1
Klenk	Myrrh	3351A121004	1
Klenk	Myrrh	3351A100628	1
Klenk	Myrrh	3351A160330	1
Klenk	Nettle leaf, cut	4513E3054	1
Klenk	Nettle leaf, cut	2381A140221	1
Klenk	Nettle leaf, cut	A130122	1
Klenk	Nettle leaf, cut	A130703	1
Klenk	Nettle leaf, cut	A110913	1
Klenk	Nettle leaf, cut	2381A150109	1
Klenk	Nettle leaf, cut	2381A151012	1
Klenk	Nettle leaf, cut	7470A111117	1
Klenk	Nettle leaf, cut	2381a130122	1
Klenk	Nettle leaf, cut	2381A121010	2
Klenk	Nettle leaf, cut	1107211689	1
Klenk	Nettle leaf, cut	2381A110913	30
Klenk	Nettle leaf, cut	2381A130122	30
Klenk	Nettle leaf, cut	2381A120619	16
Klenk	Nettle leaf, cut	2381a100818	1
Klenk	Nettle leaf, cut	2381A130703	16
Klenk	Nettle leaf, cut	2381A141124	1
Klenk	Nettle leaf, cut	2372A130703	1
Klenk	Nettle leaf, cut	2381A110809	1
Klenk	Nettle leaf, cut	2381A-120619	1
Klenk	Nettle leaf, cut	1913A-03054	1
Klenk	Nettle leaf, cut	2381A-121010	1
Klenk	Nettle leaf, cut	114Q-03054	1
Klenk	Nettle leaf, cut	2381a120619	4
Klenk	Nettle root, cut	nachprüfung	1
Klenk	Nettle root, cut	9931B120927	1
Klenk	Nettle root, cut	6631B120416	1
Klenk	Nettle root, cut	6631N110513	1
Klenk	Nettle seed	7470A160928	2
Klenk	Nettle seed	7470A141021	1
Klenk	Nettle seed	7470A110418	1
Klenk	Nettle seed	2021505	1
Klenk	Nettle seed	7470A151009	1
Klenk	Nutmeg, powdered (spi…	7325A130304	1
Klenk	Nutmeg, powdered (spi…	7325A130515	1
Klenk	Nutmeg, powdered (spi…	A130304	2
Klenk	Nutmeg, powdered (spi…	7325A120903	2
Klenk	Nutmeg, powdered (spi…	7325a120903	1
Klenk	Oak bark, cut	C-280513-2	1
Klenk	Oak bark, cut	761A110816	9
Klenk	Oak bark, cut	761A090420	2
Klenk	Oak bark, cut	761A110816	1
Klenk	Oak bark, cut	761A110816	2
Klenk	Olive leaf	2211B131025	1
Klenk	Olive leaf	2211B130425	3
Klenk	Olive leaf	2211B120417	2
Klenk	Olive leaf	2211B150818	1
Klenk	Orange peel, cut	531a130204	1
Klenk	Orange peel, cut	531A091125	3
Klenk	Orange peel, cut	531A130204	6
Klenk	Oregano herb	4221A120315	2
Klenk	Orris root	B130102	1

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Supplier	Substance	Batch	Spectra
Klenk	Orris root	B111013	1
Klenk	Orris root	6831B111013	1
Klenk	Parsley root, cut	6441A150811	1
Klenk	Parsley root, cut	6441A121024	5
Klenk	Parsley root, cut	6441A120283	1
Klenk	Parsley root, cut	6441A120606	7
Klenk	Parsley root, cut	6441A120110	1
Klenk	Parsley seed	nachprüfung	1
Klenk	Parsley seed	7370A09120	1
Klenk	Passionflower herb, cut	4231A-110913	1
Klenk	Passionflower herb, cut	A120329	2
Klenk	Passionflower herb, cut	4231A120329	2
Klenk	Peony root, cut	6421B120327	1
Klenk	Peony root, cut	B110916	2
Klenk	Peppermint leaf, cut	A121009	1
Klenk	Peppermint leaf, cut	2181A151119	1
Klenk	Peppermint leaf, cut	2181A13020	1
Klenk	Peppermint leaf, cut	2181a120913	3
Klenk	Peppermint leaf, cut	1209211505	1
Klenk	Peppermint leaf, cut	2181A-120913	1
Klenk	Peppermint leaf, cut	2181A-101013	1
Klenk	Peppermint leaf, cut	2181A100323	1
Klenk	Peppermint leaf, cut	2181A101013	10
Klenk	Peppermint leaf, cut	1913A-01505	1
Klenk	Peppermint leaf, cut	312172/3	1
Klenk	Peppermint leaf, cut	1001311505	1
Klenk	Peppermint leaf, cut	2161A-121206	1
Klenk	Peppermint leaf, cut	2181B130717	10
Klenk	Peppermint leaf, cut	4113Q1505	1
Klenk	Peppermint leaf, cut	2161a121029	1
Klenk	Peppermint leaf, cut	2161A111207	1
Klenk	Peppermint leaf, cut	2181A120913	39
Klenk	Peppermint leaf, cut	2161A110207	1
Klenk	Peppermint leaf, cut	CH.2161B080818	1
Klenk	Peppermint leaf, cut	4513E1503	1
Klenk	Peppermint leaf, cut	2161A07020203	1
Klenk	Peppermint leaf, cut	2161A121009	6
Klenk	Peppermint leaf, cut	A130806	1
Klenk	Peppermint leaf, cut	2161	1
Klenk	Peppermint leaf, cut	2161B140321	1
Klenk	Peppermint leaf, cut	2161A130806	10
Klenk	Peppermint leaf, cut	2161A120718	4
Klenk	Peppermint leaf, cut	2183A120913	4
Klenk	Peppermint leaf, cut	2181A110512	9
Klenk	Peppermint leaf, cut	2161A121206	15
Klenk	Peppermint leaf, cut	2181A130320	7
Klenk	Primrose flower	B130808	1
Klenk	Primrose flower	1541B130808	6
Klenk	Primrose flower	B110314	1
Klenk	Primrose flower	1540A-100907	1
Klenk	Primrose flower	B130808	1
Klenk	Primrose flower	1541B110314	11
Klenk	Primrose flower	1541B100414	2
Klenk	Primrose flower	1540A100907	1
Klenk	Primrose flower	A111018	1
Klenk	Primrose root, cut	6461A100511	1
Klenk	Primrose root, cut	B130218	3
Klenk	Psyllium seed	A130128	1
Klenk	Psyllium seed	7380A150520	4
Klenk	Psyllium seed	7380A130128	6

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Supplier	Substance	Batch	Spectra
Klenk	Psyllium seed	7380A120911	20
Klenk	Psyllium seed	7380A120109	26
Klenk	Psyllium seed	7380A111018	2
Klenk	Psyllium seed	7380a111018	1
Klenk	Psyllium seed	7380A110317	1
Klenk	Psyllium seed	7560a120330	1
Klenk	Psyllium seed	7560A130418	1
Klenk	Psyllium seed	7560A120330	1
Klenk	Psyllium seed	7560A140203	1
Klenk	Psyllium seed	A120109	1
Klenk	Psyllium seed	A120911	1
Klenk	Psyllium seed	7380a120109	5
Klenk	Raspberry leaf, cut	2291A120813	1
Klenk	Raspberry leaf, cut	2291A130320	1
Klenk	Raspberry leaf, cut	2291A120806	6
Klenk	Raspberry leaf, cut	2271C120508	6
Klenk	Raspberry leaf, cut	2291A12112o	1
Klenk	Raspberry leaf, cut	2291a111124	1
Klenk	Raspberry leaf, cut	A130430	1
Klenk	Raspberry leaf, cut	2291A121120	4
Klenk	Raspberry leaf, cut	12273107	1
Klenk	Raspberry leaf, cut	2291A110125	1
Klenk	Red clover flower	1640A120116	1
Klenk	Red clover flower	nachprüfung	3
Klenk	Red clover flower	1640a130122	1
Klenk	Red clover flower	1640A130122	16
Klenk	Red clover flower	1640A110727	3
Klenk	Red clover flower	811Q-07163	1
Klenk	Red clover flower	7470A130311	1
Klenk	Red-rose petal	1561A121016	1
Klenk	Red-rose petal, cut	1561B101210	3
Klenk	Red-rose petal, cut	1561A110404	1
Klenk	Red-rose petal, cut	1561A121016-34023101	1
Klenk	Redwood	5961B111219	1
Klenk	Restharrow root, cut	6411B130404	4
Klenk	Restharrow root, cut	4296345	1
Klenk	Restharrow root, cut	6411B101216	2
Klenk	Restharrow root, cut	6411B111110	3
Klenk	Restharrow root, cut	B111110	1
Klenk	Restharrow root, cut	6411111110	1
Klenk	Rhubarb, cut	6891B111118	1
Klenk	Rhubarb, cut	7761B130514	2
Klenk	Ribwort plantain, cut	4281N111121	2
Klenk	Ribwort plantain, cut	A110816	1
Klenk	Ribwort plantain, cut	427A111125	1
Klenk	Ribwort plantain, cut	4271A130716	1
Klenk	Ribwort plantain, cut	4271A-110816	1
Klenk	Ribwort plantain, cut	4271A130115	7
Klenk	Ribwort plantain, cut	4271A110816	6
Klenk	Ribwort plantain, cut	4271A100615	4
Klenk	Robert herb, cut	3951B12118	1
Klenk	Robert herb, cut	3951-A-110621	1
Klenk	Robert herb, cut	3951B121218	2
Klenk	Rose hips peel, cut	2851A150310	4
Klenk	Rose hips peel, cut	2851A120102	5
Klenk	Rose hips peel, cut	2851A120904	4
Klenk	Rose hips peel, cut	2851A-110202	1
Klenk	Rose hips peel, cut	2851A101119	3
Klenk	Rose hips peel, cut	A120904	3
Klenk	Rose hips peel, cut	2841B111019	2

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Supplier	Substance	Batch	Spectra
Klenk	Rose hips peel, cut	3613M-01543	1
Klenk	Rose hips peel, cut	2851A110202	1
Klenk	Rose hips with peel, ...	2841B130523	2
Klenk	Rose hips with peel, ...	2841B110317	1
Klenk	Rose hips with peel, ...	B130523	1
Klenk	Rose hips with peel, ...	B111019	1
Klenk	Rose hips with peel, ...	A120904	1
Klenk	Rose hips with peel, ...	3613M-01542	1
Klenk	Rose hips with peel, ...	2851A120904	1
Klenk	Rose hips with peel, ...	2841B081210	1
Klenk	Rose hips with peel, ...	A120719	1
Klenk	Roselle	1431B111122	1
Klenk	Roselle	1431B131015	2
Klenk	Roselle	1431B130205	1
Klenk	Roselle	1431B-110519	1
Klenk	Roselle	B130205	1
Klenk	Rosemary leaf, cut	2261A131118	12
Klenk	Rosemary leaf, cut	112E-01510	1
Klenk	Rosemary leaf, cut	A130201	2
Klenk	Rosemary leaf, cut	2261A140910	3
Klenk	Rosemary leaf, cut	2261A130201	31
Klenk	Rosemary leaf, cut	2261A100916	2
Klenk	Rosemary leaf, cut	2261A120224	22
Klenk	Rosemary leaf, cut	2261A150622	3
Klenk	Rosemary leaf, cut	2261A160905	1
Klenk	Rosemary leaf, cut	2261a160329	1
Klenk	Rosemary leaf, cut	61A131118	1
Klenk	Rosemary leaf, cut	2261a130201	1
Klenk	Rosemary leaf, cut	2261a120224	4
Klenk	Rosemary leaf, cut	2261A081117	1
Klenk	Rosemary leaf, cut	301401	1
Klenk	Rosemary leaf, cut		1
Klenk	Rue herb, cut	4361A07020601	1
Klenk	Rue herb, cut	4361A120207	1
Klenk	Rue herb, cut	A120207	1
Klenk	Rue herb, cut	4361A100707	3
Klenk	Saffron (spice)	384A110608	1
Klenk	Saffron (spice)	384a120410	1
Klenk	Saffron (spice)	384A130320	2
Klenk	Saffron (spice)	384A-120410	1
Klenk	Saffron filaments	380A130613	1
Klenk	Saffron filaments	380A120416	2
Klenk	Saffron filaments	380a120416	1
Klenk	Saffron filaments	380a130613	1
Klenk	Sage leaf, cut	2301A110420	1
Klenk	Sage leaf, cut	2301c120126	2
Klenk	Sage leaf, cut	2301C12026	1
Klenk	Sage leaf, cut	2301A100726	1
Klenk	Sage leaf, cut	2301C120126	17
Klenk	Sage leaf, cut	C120126	1
Klenk	Sage leaf, cut	21021313	1
Klenk	Sage leaf, cut	2301C12126	1
Klenk	Sage leaf, cut	2301a120403	2
Klenk	Sage leaf, cut	2310A120403	1
Klenk	Sarsaparilla root, cut	6561B111108	2
Klenk	Sarsaparilla root, cut	B111108	1
Klenk	Senna leaf, cut	2331b130214	1
Klenk	Senna leaf, cut	2331B150903	1
Klenk	Senna leaf, cut	2331A100525	2
Klenk	Senna leaf, cut	2331C120614	12

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Supplier	Substance	Batch	Spectra
Klenk	Senna leaf, cut	B130214	1
Klenk	Senna leaf, cut	2331B120403	5
Klenk	Senna leaf, cut	2331B120521	6
Klenk	Senna leaf, cut	2331c130326	2
Klenk	Senna leaf, cut	2331B130214	4
Klenk	Senna leaf, cut	2331C130326	17
Klenk	Senna leaf, cut	2331B110907	2
Klenk	Senna leaf, cut	2331A110207	2
Klenk	Senna pods, tinnevelly	1041B120327	2
Klenk	Shepherd's purse, cut	3671B111201	1
Klenk	Shepherd's purse, cut	B111201	1
Klenk	Shepherd's purse, cut	3671A-100414	2
Klenk	Silverweed, cut	3551A110913	2
Klenk	Silverweed, cut	A110913	2
Klenk	Silverweed, cut	H-280513-3	1
Klenk	Silverweed, cut	3551A130903	1
Klenk	Sodium dihydrogen pho...	1301005-01	1
Klenk	Sodium hydrogen carbo...	12d11-n02	1
Klenk	Sorrel herb, cut	11165306	1
Klenk	Spearmint leaf, cut	2171A120711	1
Klenk	St. John's wort, cut	4021A130612	5
Klenk	St. John's wort, cut	4021A00819	1
Klenk	St. John's wort, cut	4021A120905	10
Klenk	St. John's wort, cut	4021A100919	1
Klenk	St. John's wort, cut	A121120	1
Klenk	St. John's wort, cut	15068103	2
Klenk	St. John's wort, cut	4021A100819	28
Klenk	St. John's wort, cut	4021a100819	1
Klenk	St. John's wort, cut	268913	2
Klenk	St. John's wort, cut	4021B110321	4
Klenk	St. John's wort, cut	4021A100819914	2
Klenk	St. John's wort, cut	4021a120604	2
Klenk	St. John's wort, cut	A130612	3
Klenk	Star anise	2695B120308	1
Klenk	Star anise	2690A130903	2
Klenk	Star anise	2690A120809	1
Klenk	Star anise	2690A111013	3
Klenk	Star anise	2696B111109	1
Klenk	Star anise	2690A101026	2
Klenk	Star anise	B111109	1
Klenk	Stemless carline root	12097301	1
Klenk	Stemless carline root	6194B110831	1
Klenk	Stemless carline root	69191B120726	1
Klenk	Stemless carline root	6194b110831	1
Klenk	Stemless carline root	B110831	1
Klenk	Stemless carline root	6191B120726	5
Klenk	Stemless carline root	6191b120726	3
Klenk	Stemless carline root	6191B130228	2
Klenk	Strawberry leaf, cut	A130430	1
Klenk	Strawberry leaf, cut	2031B110224	2
Klenk	Strawberry leaf, cut	2031A130430	2
Klenk	Strawberry leaf, cut	B120925	1
Klenk	Sunflower, cut	1711I-07036	1
Klenk	Sunflower, cut	1701B091013	1
Klenk	Sweet fennel	2870A131002	1
Klenk	Sweet fennel	2870130304A	1
Klenk	Sweet fennel	2870A130304	4
Klenk	Sweet fennel	2870A140528	1
Klenk	Sweet woodruff herb, ...	3601B090114	1
Klenk	Sweet woodruff herb, ...	B090114	3

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Supplier	Substance	Batch	Spectra
Klenk	Sweet woodruff herb, ...	3601B140321	1
Klenk	Tall golden rod, cut	4521A-110816	1
Klenk	Tall golden rod, cut	A110209	1
Klenk	Tall golden rod, cut	4521A110209	5
Klenk	Tall golden rod, cut	4521A100414	1
Klenk	Tall golden rod, cut	1781B110706	1
Klenk	Tall hawkweed, cut	B111005	1
Klenk	Tall hawkweed, cut	3611B11105	1
Klenk	Theriac, powdered	12189403	1
Klenk	Thyme, rubbed	2902211688	1
Klenk	Thyme, rubbed	4622A130910	2
Klenk	Thyme, rubbed	4622a130109	4
Klenk	Thyme, rubbed	4622A-120111	1
Klenk	Thyme, rubbed	4622a120111	4
Klenk	Thyme, rubbed	1910211688	1
Klenk	Thyme, rubbed	4622a110728	2
Klenk	Thyme, rubbed	4622A1200111	1
Klenk	Thyme, rubbed	4622A130109	86
Klenk	Thyme, rubbed	A130910	3
Klenk	Thyme, rubbed	2103311688	1
Klenk	Thyme, rubbed	4622B110519	3
Klenk	Thyme, rubbed	1005	1
Klenk	Thyme, rubbed	11121307	1
Klenk	Thyme, rubbed	4622A141203	1
Klenk	Tormentil	6911B141114	1
Klenk	Tormentil	6911B111013	11
Klenk	Tormentil	6911B150825	1
Klenk	Tormentil	6911B131029	4
Klenk	Tormentil	6911B140227	1
Klenk	Tormentil	6914b120112	1
Klenk	Trichloroacetic acid	11294318	2
Klenk	Turmeric root, cut	6741B121030	1
Klenk	Turmeric root, cut	6741a110202	1
Klenk	Turmeric, javanese, cut	6731B150630	1
Klenk	Turmeric, javanese, cut	B130117	1
Klenk	Valerian root, cut	6641B100823	1
Klenk	Valerian root, cut	6641B130226	11
Klenk	Valerian root, cut	6641B-110317	1
Klenk	Valerian root, cut	6641B120417	3
Klenk	Valerian root, cut	6645B130226	1
Klenk	Valerian root, cut	13196808	3
Klenk	Verbena herb, cut	4654B120611	1
Klenk	Verbena herb, cut	12345	1
Klenk	Verbena herb, cut	4651B120611	18
Klenk	Verbena herb, cut	A130923	1
Klenk	Verbena herb, cut	4651B130611	2
Klenk	Verbena herb, cut	4651B110310	3
Klenk	Verbena herb, cut	4651A070828	3
Klenk	Vine leaf, cut	2491B120918	1
Klenk	Vine leaf, cut	2491B100707	1
Klenk	Walnut bark, cut	711B120906	2
Klenk	Walnut bark, cut	711B120613	3
Klenk	Walnut bark, cut	7114B120906	1
Klenk	Walnut bark, cut	711B111020	6
Klenk	Walnut bark, cut	711B080806	1
Klenk	Walnut bark, cut	711b120613	1
Klenk	Walnut leaf, cut	2111A110816	1
Klenk	Walnut leaf, cut	2111A-120123	1
Klenk	Walnut leaf, cut	A130410	1
Klenk	Walnut leaf, cut	2111B151028	2

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Supplier	Substance	Batch	Spectra
Klenk	Walnut leaf, cut	2111A130410	4
Klenk	Walnut leaf, cut	2111A131029	1
Klenk	Walnut leaf, cut	F-280513-1	1
Klenk	White deadnettle flower	1470A080910	1
Klenk	White deadnettle flower	1470a120111	1
Klenk	White deadnettle flower	1470a080103	1
Klenk	White deadnettle flower	1470A120111	7
Klenk	White deadnettle flower	1470A080103	1
Klenk	White deadnettle flower	nachprüfung	1
Klenk	White mustard seed	7250A120911	1
Klenk	White mustard seed, p...	7254A141202	1
Klenk	Wild pansy, cut	4681A120806	15
Klenk	Wild pansy, cut	4681B130715	7
Klenk	Wild pansy, cut	4681A110303	5
Klenk	Wild pansy, cut	4681A-120806	1
Klenk	Wild pansy, cut	11216103	5
Klenk	Wild pansy, cut	B130715	1
Klenk	Willow bark, cut	811B100910	4
Klenk	Willowherb, small flo...	4721C110701	4
Klenk	Willowherb, small flo...	4721C130618	4
Klenk	Willowherb, small flo...	4721C2120321	2
Klenk	Willowherb, small flo...	4721B130528	1
Klenk	Willowherb, small flo...	C120321	1
Klenk	Willowherb, small flo...	4721A120418	10
Klenk	Willowherb, small flo...	4721A120903	7
Klenk	Willowherb, small flo...	4721A101010	4
Klenk	Willowherb, small flo...	2512U-01641	1
Klenk	Willowherb, small flo...	A120418	1
Klenk	Wormwood herb, cut	3461A110324	2
Klenk	Wormwood herb, cut	A110324	1
Klenk	Wormwood herb, cut	3461A1100324	1
Klenk	Wormwood herb, cut	3461A121130	2
Klenk	Yarrow flower, rubbed	4181A121130	1
Klenk	Yarrow flower, rubbed	1511A111129	1
Klenk	Yarrow flower, rubbed	A110816	3
Klenk	Yarrow herb, cut	4181A110111	19
Klenk	Yarrow herb, cut	4181a11011	1
Klenk	Yarrow herb, cut	4181a130513	1
Klenk	Yarrow herb, cut	4181A130710	1
Klenk	Yarrow herb, cut	15333007	1
Klenk	Yarrow herb, cut	4181B130709	2
Klenk	Yarrow herb, cut	4181A121130	16
Klenk	Yarrow herb, cut	4181A101102	3
Klenk	Yarrow herb, cut	A130709	1
Klenk	Yarrow herb, cut	4181A111122	7
Klenk	Yarrow herb, cut	4181A130513	12
Klenk	Yarrow herb, cut	4181130709	1
Klenk	Yellow chaste weed, cut	1591A110511	15
Klenk	Yellow chaste weed, cut	1591A-110511	1
Klenk	Zedoary root, cut	6941B121025	3
Klenk	Zedoary root, cut	6941B110329	2
Klenk	Zedoary root, powdered	12007505	1
Kottas	Bitter fennel	P15301479	1
Kräuter Sc	Betony herb, cut	38546	1
kräuter schulte	Bitter orange peel, cut	51265	1
kräuter schulte	Gentian root, cut	52348	1
kräuter schulte	Red-rose petal, cut	47543	1
kräuter schulte	Tormentil	51952	1
Kräuter Schulte	Abrotani herb, cut	50870	1
Kräuter Schulte	Black cohosh, cut	3308M-02176	1

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Supplier	Substance	Batch	Spectra
Kräuter Schulte	Blackthorn flower, ru…	53233	2
Kräuter Schulte	Bucho leaf	54519	1
Kräuter Schulte	China Pai Mu Tan	52783	1
Kräuter Schulte	Couch grass rhizome, …	53016	2
Kräuter Schulte	Dill fruit	6363	1
Kräuter Schulte	Dryas octopetala herb…	38970	1
Kräuter Schulte	Geum urbanum herb, cut	51737	1
Kräuter Schulte	Meadowsweet flower, r…	53473	1
Kräuter Schulte	Meadowsweet flower, r…	51369	1
Kräuter Schulte	Red clover flower	53778	1
Kräuter Schulte	Red tea	52029	1
Kräuter Schulte	Saponaria root, cut	54500	1
Kräuter Schulte	Saponaria root, cut	54977	1
Kräuter Schulte	Saponaria root, cut	54524	2
Kräuter-Schulte	Peppermint leaf, cut	56254	1
Kräuter-Schulte	Sorrel herb, cut	55272	1
Kräuter-Schulte	Sweet woodruff herb, …	52878	1
Kräuter-Schulte	Zedoary root, cut	25713	1
linnea/salficalcan	Griffonia seed extract	50814001	1
Lohman	Sodium sulfate decahy…	1210005-02	3
Lycored	Caromix	CMXVBAF-011301	1
Macfarlan Smith/Noweda	Cocaine hydrochloride	15224802	1
Macsen laboratories/P…	Methylrosanilinium ch…	1989	1
Magnesia/ Noweda	Magnesium sulfate hep…	26251	3
meltem	Sweet fennel	türkei	1
Merck	Codeine phosphate hem…	120765	1
Merck	Heavy alkaline bismut…	75419201	1
Merck	Trichloroacetic acid	12821	1
Microsin Pharmorgana	Copper orotate dihydr…	565313	1
Microsin Pharmorgana	Zinc orotate dihydrate	ORZ00113	1
Nachprüfung	Abrotani herb, cut	3451A070919	1
Nachprüfung	Aniseed	5010U-01530	1
Nachprüfung	Black cohosh, cut	10281113	1
Nachprüfung	Blackcurrant leaf, cut	1003	1
Nachprüfung	Fenugreek, powdered	2412E02239	1
Nachprüfung	Hay flower	1911E01459	1
Nachprüfung	Heather, cut	5110A03224	1
Nachprüfung	Potassium hydrocarbon…	1105	1
Nachprüfung	Stemless carline root	2812U02133	1
Nachprüfung	Wild pansy, cut	10291007	1
new zealand pharmaceu…	Deoxycholic acid	411656	1
noweda	Aniseed	11101201	3
noweda	Dandelion root, cut		1
noweda	Iceland moss, cut		1
noweda	Lavender flower	11327904	1
noweda	Nettle leaf, cut	10291404	1
noweda	Valerian root, cut	11103603	1
noweda	Walnut leaf, cut		1
noweda	Wormwood herb, cut	11085709	1
Noweda	Agnus castus fruit	12016902	2
Noweda	Agrimony, cut	9300106	1
Noweda	Alchemilla, cut	1215301	1
Noweda	Aloes, cape, powdered	11132104	1
Noweda	Ammonium hydrogen car…	11145601	3
Noweda	Angelica root	12070802	1
Noweda	Angelica root	38011111	2
Noweda	Angelica root	272720	2
Noweda	Aniseed	521103501	1
Noweda	Aniseed	11101203	10
Noweda	Bean shells, cut	265670	1

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Supplier	Substance	Batch	Spectra
Noweda	Bearberry leaf, cut	267926	2
Noweda	Bearberry leaf, cut	11213011	6
Noweda	Bentonite	1301012-01	1
Noweda	Bentonite	11304415	1
Noweda	Birch leaf, cut	12193004	7
Noweda	Birch leaf, cut	12193105	4
Noweda	Birch leaf, cut	11189508	2
Noweda	Bitter fennel	12094707	1
Noweda	Bitter orange flower ...	11049211	1
Noweda	Black mustard seed, p...	12350204	7
Noweda	Boldo leaf, cut	11016507	1
Noweda	Caffeine citrate	CCC-1101	1
Noweda	Calcium hydrogen phos...	11287501	2
Noweda	Calendula flower, cut	268876	1
Noweda	Calendula flower, cut	12221709	9
Noweda	Caraway fruit	12226503	6
Noweda	Caraway fruit, pounded	12116904	4
Noweda	Centaury, cut	10104012	2
Noweda	Copper (II) sulfate p...	12B09-N10	1
Noweda	Copper (II) sulfate p...	11F21-N03	1
Noweda	Coriander	13010302	4
Noweda	Coriander	12080902	1
Noweda	Damiana leaf, cut	200151	1
Noweda	Dandelion herb with r...	521101126	1
Noweda	Dandelion herb with r...	11030305	3
Noweda	Dandelion herb with r...	11030311	5
Noweda	Dandelion herb with r...	11217101	1
Noweda	Dithranol	APDT/375/2012	2
Noweda	Dithranol	DT/375/2012D	3
Noweda	Elecampane rhizome, cut	6341B111118	3
Noweda	Equisetum stem, cut	10375511	1
Noweda	Hawthorn leaf with fl...	10273515	7
Noweda	Hawthorn leaf with fl...	11366001	2
Noweda	Heavy alkaline bismut...	13/01-N02	1
Noweda	Hop strobile	12008313	1
Noweda	Hop strobile	274725	1
Noweda	Horse chestnut leaf, ...	11063502	2
Noweda	Horse chestnut leaf, ...	11063501	1
Noweda	Iceland moss, cut	11101602	1
Noweda	Ispaghula seed	7560A110125	1
Noweda	Java tea, cut	2221B101213	2
Noweda	Juniper	521101635	1
Noweda	Ladys bedstraw herb,...	10375701	1
Noweda	Laurel leaf	12299101	2
Noweda	Lime flower, cut	10273608	3
Noweda	Lime flower, cut	12170702	4
Noweda	Liqourice root, peeled	521200852	1
Noweda	Liqourice root, peeled	70226/1	1
Noweda	Lycopodium herb, cut	11050001	1
Noweda	Lycopodium herb, cut	9378808	1
Noweda	Magnesium chloride he...	11H01-N03	1
Noweda	Magnesium sulfate hep...	11H29-N02	3
Noweda	Manna, cut	5221A110817	2
Noweda	Manna, powdered	11170102	1
Noweda	Marian thistle herb, ...	10315905	1
Noweda	Marrubium vulgare her...	4141A080513	1
Noweda	Marshmallow leaf, cut	13199604	5
Noweda	Matricaria flower	11169603	2
Noweda	Matricaria flower	12111903	3
Noweda	Melissa leaf, cut	10310913	1

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Supplier	Substance	Batch	Spectra
Noweda	Methylrosanilinium ch…	9238104	1
Noweda	Methylrosanilinium ch…	12H28-N06	1
Noweda	Methylrosanilinium ch…	9238101	1
Noweda	Methylrosanilinium ch…	2159	2
Noweda	Molecular distilled g…	11160010	1
Noweda	Nettle leaf, cut	10375901	5
Noweda	Nettle leaf, cut	41010712	1
Noweda	Nettle leaf, cut	262338	1
Noweda	Nystatin	1207009-01	10
Noweda	Oak bark, cut	10348617	11
Noweda	Oat straw, cut	11280003	1
Noweda	Parsley seed	7370A091120	5
Noweda	Passionflower herb, cut	10079510	1
Noweda	Peppermint leaf, cut	11294411	2
Noweda	Peppermint leaf, cut	2911U-01505	1
Noweda	Potassium hydrocarbon…	1004019-01	1
Noweda	Prednisolone 1:10 (ri…	11L13-N06	1
Noweda	Primrose root, cut	12064504	7
Noweda	Raspberry leaf, cut	12103101	11
Noweda	Restharrow root, cut	11103102	1
Noweda	Restharrow root, cut	272831	3
Noweda	Rhubarb, cut	6891B100421	1
Noweda	Ribwort plantain, cut	251029	1
Noweda	Ribwort plantain, cut	10315712	4
Noweda	Rose hips peel, cut	275394	3
Noweda	Roselle	11036507	2
Noweda	Sage leaf, cut	11056119	2
Noweda	Sage leaf, cut	11347511	12
Noweda	Salbutamol sulfate	13K12-N02	1
Noweda	Senna leaf, cut	11277305	2
Noweda	Shepherd's purse, cut	11036409	1
Noweda	Sodium hydrogen carbo…	11197801	1
Noweda	Stemless carline root	12163702	3
Noweda	Stemless carline root	11198101	1
Noweda	Tall golden rod, cut	11280306	4
Noweda	Theriac, powdered	11082404	1
Noweda	Thyme, rubbed	11345014	18
Noweda	Thyme, rubbed	521303908	1
Noweda	Thyme, rubbed	11345002	4
Noweda	Thyme, rubbed	11345007	7
Noweda	Tonka beans	1040A111026	1
Noweda	Tragacanth, powdered	12108807	1
Noweda	Tragacanth, powdered	11128910	1
Noweda	Valerian root, cut	11103609	6
Noweda	Valerian root, cut	12033804	10
Noweda	Walnut leaf, cut	10050416	2
Noweda	Walnut leaf, cut	10050414	1
Noweda	Willow bark, cut	4609A-01305	1
Noweda	Willowherb, small flo…	10326106	3
Noweda	Yarrow herb, cut	12378603	1
Noweda	Zedoary root, cut	11091605	5
Noweda 06.04.2016	Bitter fennel	15443201	1
Noweda/Henry Lamotte	Black mustard seed, p…	1493708	1
Noweda10.02.2017	Tormentil	15364313	1
Otto Fischer GmbH	Sodium hydrogen carbo…	6521021	1
Phagron/Ph	Aluminium chloride he…	11I23-N06	1
Pharmachem.Pößneck/Ph…	Amphetamine sulfate	13G08-N11	4
Pharmorgana	Caromix	cmx-PL101112	1
Pharmorgana	Copper orotate dihydr…	CH-565313	1
Phoenix	Aluminium chloride he…	11/23-N06	4

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Supplier	Substance	Batch	Spectra
Phoenix	Aluminium chloride he…	13D22-N09	37
Phoenix	Elder flower, rubbed	10291309	3
Phoenix	Fenugreek	11313206	7
Phoenix	Gentian root, cut	6311B120104	1
Phoenix	Juniper		1
Phoenix	Magnesium sulfate hep…	12L10-N07	14
Phoenix	Manna, cut	522A120509	1
Phoenix	Methadone hydrochloride	15244715	1
Phoenix	Potassium hydrocarbon…	12141915	5
Phoenix	Raspberry leaf, cut	10136409	1
Phoenix	Ribwort plantain, cut	4271A11016	1
Phoenix	Sage leaf, cut	231C130326	1
Phoenix	Sodium hydrogen carbo…	13B18-N03	1
Phoenix	Tall golden rod, cut	265283	2
Phoenix	Zedoary root, cut	13010104	2
PHOENIX 19.05.2014	Black pepper	13221105	1
Phoenix 27.03.2012	Linseed	11177302	1
Phoenix am 03.12.2010	Bearberry leaf, cut	4910B-1518	1
PHOENIX am 08.06.2012	Common wormwood herb,…	12016703	1
Phoenix am 11.06.2012	Sage leaf, cut	2301A110204	11
PHOENIX am 14.05.2012	Artichoke leaf, cut	11151905	1
Phoenix am 30.01.2013	Matricaria flower	1290A	1
Phoenix, 04.09.2012	Nettle leaf, cut	12195002	4
Phoenix, 13.09.2012	Thyme, rubbed	44622A120111	1
Phonix	Linseed	13296703	3
phönix	Aloes, cape, cut	15283011	1
phönix	Myrrh	3351a160330	1
phönix	Myrrh	15021411	1
phönix	Sodium alginate	11509036-02	1
phönix	Tormentil	15364343	1
Phönix	Aluminium chloride he…	12/27-N01	10
Phönix	Aluminium potassium s…	110804902	1
Phönix	Aluminium potassium s…	14263801	1
Phönix	Amphetamine sulfate	13B11N04	1
Phönix	Amphetamine sulfate	16a29-b03-328317	1
Phönix	Amphetamine sulfate	16A29-B03-328317	1
Phönix	Birch leaf, cut	1901120802	1
Phönix	Black mustard seed, p…	17196303	1
Phönix	Centaury, cut	11093612	2
Phönix	Cinchocaine hydrochlo…	13E13-N07	1
Phönix	Cinnamon rods (Ceylon…	610A130927	1
Phönix	Coltsfoot leaf, cut	278296	3
Phönix	Common broom herb, cut	12358801	2
Phönix	Creatine	mysjhskeu	1
Phönix	Dandelion herb with r…	6611B110131	2
Phönix	Equisetum stem, cut	12288807	2
Phönix	Gentian root, cut	269197	3
Phönix	Gentian root, cut	6311B120315	8
Phönix	Ginger, peeled	13310601	1
Phönix	Hyssop herb, cut	11374306	1
Phönix	Ivy leaf, cut	11101102	1
Phönix	Jasmine flower	12143206	1
Phönix	Java tea, cut	12225701	1
Phönix	Juniper	13020903	1
Phönix	Lime flower, cut	1611A12120	1
Phönix	Linseed	7307A111107	13
Phönix	Liquorice root, natur…	276425	1
Phönix	Male speedwell wort, …	13089201	4
Phönix	Marshmallow root, pee…	6071A130612	4
Phönix	Marshmallow root, pee…	6071a120314	1

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Supplier	Substance	Batch	Spectra
Phönix	Matricaria flower	1300A120426	1
Phönix	Melilot herb, cut	1237903	1
Phönix	Melissa leaf, cut	2161A150324	1
Phönix	Nystatin	12017005	3
Phönix	Oak bark, cut	10348609	3
Phönix	Peppermint leaf, cut	2181A141016	1
Phönix	Rhubarb, cut	12211905	5
Phönix	Rose hips with peel, ...	2841B130523	1
Phönix	Rose hips with peel, ...	10281021	1
Phönix	Silverweed, cut	11328107	7
Phönix	Sodium carbonate deca...	13036904	3
Phönix	Sodium hydrogen carbo...	206027	2
Phönix	Sodium hydrogen carbo...	13390515	1
Phönix	Sodium monohydrogenph...	1302800,	1
Phönix	Sodium monohydrogenph...	13028101	1
Phönix	Talcum	10148805Retest	1
Phönix	Tormentil	15364302	1
Phönix	Wormwood herb, cut	12355806	6
Phönix	Yarrow herb, cut	1237962	1
Phönix	Yarrow herb, cut	13029103	18
Phönix	Aluminium potassium s...	13356108	1
Phönix 04.03.13	Saponaria root, cut	6561B111108	1
Phönix 05.10.2012	Calendula flower, cut	121005	1
Phönix 05.10.2012	Walnut leaf, cut	121005	1
Phönix 05.10.2012	Yarrow herb, cut	121005	1
Phönix 08.03.13	Solanum dulcamara ste...	5601A080513	4
Phönix 08.08.2012	Caraway fruit	1103213	1
Phönix 10.01.2014	Senna leaf, cut	13136707	1
Phönix 12.10.13	Knotgrass, cut	12368906	4
Phönix 18.10.2013	Sodium dihydrogen pho...	12198512	1
phönix 22.01.2013	Yarrow herb, cut	271873	1
Phönix 23.08.2012	Bearberry leaf, cut	23910B120314	1
Phönix 24.09.2012	Mistletoe, cut	120924	1
Phönix 24.12.12	Valerian root, cut		1
Phönix 27.03.2013	Calcium chloride dihy...	1107010-02	1
Phönix 31.10.12	Passionflower herb, cut	12031701	2
phönix 8.08.2013	Juniper	289017	1
Phönix Gotha	Goat's rue, cut	11307905	1
Phönix Gotha	Marjoram herb, rubbed	11212709	1
Phönix Gotha	Nystatin	4014941	1
Phönix Gotha	Sodium monohydrogenph...		1
Phönix Gotha	Sodium thiosulfate pe...	10E07-N13	1
Phönix Gotha	Stemless carline root	6191B111205	1
phönix, 13.06.2012	Calcium chloride dihy...	11230918	1
phönix, 14.01.2013	Hop strobile	130114	1
Phönix, 15.01.2013	Aluminium potassium s...	12I24-M03	1
Phönix/	Alchemilla, cut	14066009	2
Phönix/	St. John's wort, cut	14065707	1
Phönix/Euro	Magnesium chloride he...	1208025-01	2
Phönix/Phönix	Black mustard seed, p...	16333503	1
Probe	Elder root, cut	12345	1
Probe	Peppermint leaf, cut	1223456	1
Productos Quimicos	D-(+)-mannose	16000524	1
Purren Apotheke	Heavy alkaline bismut...	11H31-N06	1
Redwood	Damiana leaf, cut	216451	1
Richter	Common wormwood herb,...	b200112	1
Richter	Elecampane rhizome, cut	P158683	1
Richter	Gentian root, cut	P200907	1
Richter	Ginger, peeled	KR27992	1
Richter	Ground ivy herb, cut	s99/09	1

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Supplier	Substance	Batch	Spectra
Richter	Horse chestnut flower…	s-09/09	1
Richter	Lungwort herb, cut	P195884	1
Richter	Maize style, cut	B189316	1
Richter	Red-rose petal, cut	P236157	1
Richter	Tormentil	P209904	1
Rondell Apotheke	Caffeine citrate	15A05-B03-307309	2
Safic	Amygdalin	12121302	1
Safic Alcan	Amygdalin	150117	1
SAFICALCAN	Amygdalin	Test3.3.14	1
SAFICALCAN	Amygdalin	BatchATA08041002	1
SAFICALCAN	Amygdalin	13041202/2.Tonne	1
SAFICALCAN	Amygdalin	120141701	1
SAFICALCAN	Amygdalin	13041202/1.Tonne	1
SAFICALCAN	Deoxycholic acid	413678	1
SAFICALCAN	Dimercaptosuccinic acid	20140618	1
SAFICALCAN	Glycyrrhizic acid	11592	1
Safic-Alcan Deutschla…	Amygdalin	17937-AA/1	1
Safic-Alcan Deutschla…	Amygdalin	18012-AD/1	1
Salfic-Alcan	Amygdalin	NSMPK06211-BAE	1
Salfic-Alcan	Amygdalin	BAE-150610	2
sana 09.12.14 3,75	Guaiacum wood, cut	13343802	1
Sana 21.10.14 Ek 3.57	Maize style, cut	13381603	2
sanacorp	Aniseed	15398602	4
sanacorp	Artichoke leaf, cut	12173301	1
sanacorp	Caraway fruit	2656259	1
sanacorp	Dandelion herb with r…	11030310	1
sanacorp	Maize style, cut	10034711	1
sanacorp	Mallow flower, cut	10357906	1
sanacorp	Marjoram herb, rubbed	11212701	1
sanacorp	Meadowsweet flower, r…	10349304	1
sanacorp	Melilot herb, cut	10335409	1
sanacorp	Mullein flower, cut	11020706	1
sanacorp	Nettle leaf, cut	12184705	1
sanacorp	Passionflower herb, cut	11049107	1
sanacorp	Pumpkin seed, peeled	14186909	1
sanacorp	Red-rose petal, cut	10306512	1
sanacorp	Rose hips with peel, …	10281015	1
sanacorp	Rosemary leaf, cut	12221705	1
sanacorp	Sage leaf, cut	11056123	7
sanacorp	Shepherd's purse, cut	11010505	1
sanacorp	Solanum dulcamara ste…	9354603	1
sanacorp	Verbena herb, cut	12188201	1
Sanacorp	Agnus castus fruit	12274006	3
Sanacorp	Agnus castus fruit	12274008	2
Sanacorp	Alchemilla, cut	12153309	21
Sanacorp	Aluminium chloride he…	1210014-02	30
Sanacorp	Aluminium potassium s…	12184402	2
Sanacorp	Amphetamine sulfate	12/24-N03	1
Sanacorp	Bearberry leaf, cut	2391B110209	3
Sanacorp	Betony herb, cut	13048903	4
Sanacorp	Bilberry leaf, cut	2191A130410	2
Sanacorp	Caraway fruit		2
Sanacorp	Dandelion herb with r…	13108803	3
Sanacorp	Equisetum stem, cut	13344307	1
Sanacorp	European golden rod, …	12343103	1
Sanacorp	Feverfew herb, cut	12380201	3
Sanacorp	Goat's rue, cut	12017911	1
Sanacorp	Hyssop herb, cut	13336101	6
Sanacorp	Juniper	12330509	1
Sanacorp	Kelp, cut	11351105	1

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Supplier	Substance	Batch	Spectra
Sanacorp	Ladys bedstraw herb,...	12369003	10
Sanacorp	Ladys bedstraw herb,...	11265109	1
Sanacorp	Lime flower, cut	264045	1
Sanacorp	Lycopodium herb, cut	13101502	2
Sanacorp	Matricaria flower	1300A120725	2
Sanacorp	Matricaria flower	12294804	6
Sanacorp	Matricaria flower	12294809	3
Sanacorp	Methadone hydrochloride	12344806	2
Sanacorp	Methadone hydrochloride	12171913	1
Sanacorp	Nettle leaf, cut	12184707	12
Sanacorp	Nettle root, cut	11265001	2
Sanacorp	Nettle seed	13010602	1
Sanacorp	Pumpkin seed, peeled	16081212	1
Sanacorp	Raspberry leaf, cut	13038001	7
Sanacorp	Raspberry leaf, cut	13101604	3
Sanacorp	Roselle	12267508	2
Sanacorp	Senna leaf, cut	13136701	4
Sanacorp	Sodium hydrogen carbo...	12D11-N02	15
Sanacorp	Sodium monohydrogenph...	12345013	7
Sanacorp	Tormentil	12040712	3
Sanacorp	Wild pansy, cut	278106	2
Sanacorp	Wild pansy, cut	12221-01694	1
Sanacorp	Wormwood herb, cut	12103002	2
sanacorp,	Methadone hydrochloride	16135302	1
Sanacorp, 6.7.15; 1.70EUR	Oak bark, cut	14277002	1
sanacorp;3,32;18.06.15	Coriander	13299495	1
Siegfried Ltd, Divisi...	Methadone hydrochloride	15244712	1
siehe WE-Prüfprotokoll	8-quinolinol sulfate ...	96/09	1
Sigma-Aldrich	Sodium butyrate	Lot.091M-5302V	1
Sigma-Aldrich	Sodium proprionate	SLBK5249V	1
Sino Phyto	Myrrh	90001070	1
Sino Phyto	Rose hips peel, cut	1290142	1
Spangro/gepepharm	Bitter fennel	15007602	2
Spangropharm	Matricaria flower	11169606	2
Spangropharm	Mistletoe, cut	10273408	1
Spinnrad	Black cumin seed	11931059	1
Spinnrad/Phoenix	Black cumin seed	613310592	1
Stefes	Tocomax 20%	111013	1
Stefes	Tocomax 20%	30613	1
stumpf	Magnesium chloride he...	1301c012-277804	1
Symrise	D-(+)-mannose		1
Synop	Morphine hydrochloride	15I09-B08	1
Synopharm	Cocaine hydrochloride	16B11-B05	1
Synopharm am 10.09.2012	Methadone hydrochloride	12B21-No3	1
Testmessung	Amygdalin	13011101	1
Testmessung	Amygdalin	13041202	1
Testmessung	Amygdalin	13041201	3
Th. Geyer	Amphetamine sulfate	56047	1
Th. Geyer	Amphetamine sulfate	20170808-03361	1
Th. Geyer	Amphetamine sulfate	LOT067043	1
Th. Geyer	Amphetamine sulfate	PH10051	1
Th. Geyer	Amphetamine sulfate	67002	54
Th. Geyer	Amphetamine sulfate	21082013B	1
Th. Geyer	Amphetamine sulfate	67043	24
Th. Geyer	Calcium colamine phos...	260EXP1016	1
Th. Geyer	Calcium colamine phos...	7664	1
Th. Geyer	Calcium colamine phos...	33299	1
Th. Geyer	Calcium colamine phos...	14384	2
Th. Geyer	Codeine phosphate hem...	67054	1
Th. Geyer	Codeine phosphate hem...	67038	2

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Supplier	Substance	Batch	Spectra
Th. Geyer	Dihydrocodeine hydrog…	67035	2
Th. Geyer	Dihydrocodeine hydrog…	67052	10
Th. Geyer	Dihydrocodeine hydrog…	59819	1
Th. Geyer	Dihydrocodeine hydrog…	20170808-03065	1
Th. Geyer	Methadone hydrochloride	67055	1
Th. Geyer	Methadone hydrochloride	67047	3
Th. Geyer	Methadone hydrochloride	67049	1
Th. Geyer	Morphine hydrochloride	2615M-01879	1
Th. Geyer	Morphine hydrochloride	PH120087	1
Th. Geyer	Morphine hydrochloride	67036	6
Th. Geyer	Morphine hydrochloride	1415E-01879	1
Th. Geyer	Phenobarbital	67045	2
unbekannt	Magnesium chloride he…	unbekannt	1
Unisan	D-ribose	JXCZSJ13D-013	2
VDL	Basil, rubbed	12007004	1
VDL	Boldo leaf, cut	11016503	1
VDL	Equisetum stem, cut	10328914	1
VDL	Primrose flower	11206806	1
VDL	Yellow chaste weed, cut	10244406	1
VDL;15.06.15;6,83EUR	Caraway fruit	13306007	1
vedono	Aniseed, powdered	11306208	1
vedono	Frankincense	12120009	5
vedono	Frankincense	12120012	1
vedono	Rhubarb, cut	12211907	6
vedono	Roselle	12007313	1
vedono	Wild thyme, cut	11374807	2
Weltecke	Meadowsweet herb, cut	67010413	1
Weltecke	Thyme, rubbed	67101212	1
Weltecke / GEHE	Primrose flower	63011112	1
Wolf	Alchemilla, cut	p931	1
Wolf	Alchemilla, cut	B-698	2
Wolf	Alchemilla, cut	E-822	1
Wolf	Alchemilla, cut	23187	4
Wolf	Aniseed	216346	1
Wolf	Aniseed	215346	1
Wolf	Aniseed	B-671	2
Wolf	Aniseed	B671	1
Wolf	Aniseed	B216346	16
Wolf	Aniseed	L401F292b	4
Wolf	Aniseed	L401F1413	1
Wolf	Bitter fennel	B-493	1
Wolf	Bitter fennel	B-682	1
Wolf	Bitter fennel	B492	1
Wolf	Bitter fennel	B382	1
Wolf	Bitter fennel	B362	2
Wolf	Bitter fennel	B-492	5
Wolf	Bitter fennel	B-362	1
Wolf	Black cumin seed	L402F171b	3
Wolf	Black cumin seed	207204	1
Wolf	Black cumin seed	B-471	1
Wolf	Black cumin seed	L310F141b	6
Wolf	Black cumin seed	L402F1713	1
Wolf	Black cumin seed		1
Wolf	Black cumin seed	20720	8
Wolf	Calendula flower	23342	1
Wolf	Caraway fruit	B-224	1
Wolf	Dill fruit	23622	6
Wolf	Dill fruit	E-501	1
Wolf	Dill fruit	L30057	5
Wolf	Elder flower, rubbed	22749	2

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Supplier	Substance	Batch	Spectra
Wolf	Elder flower, rubbed	22765	1
Wolf	Elder flower, rubbed	E-738	1
Wolf	Elder flower, rubbed	B-810	1
Wolf	Equisetum stem, cut	B-695	1
Wolf	Equisetum stem, cut	B233885	4
Wolf	Lemon grass, cut	B654	1
Wolf	Lemon verbena leaf, cut	E-587	1
Wolf	Lemon verbena leaf, cut	B-312	1
Wolf	Lemon verbena leaf, cut	23635	1
Wolf	Lime flower, cut	22094	1
Wolf	Lime flower, cut	B449	1
Wolf	Marjoram herb, rubbed	P232243	9
Wolf	Marjoram herb, rubbed	163516	1
Wolf	Marjoram herb, rubbed	B163516	6
Wolf	Matricaria flower	23242	1
Wolf	Nettle leaf, cut	B-821	1
Wolf	Nettle leaf, cut	B821	1
Wolf	Nettle leaf, cut	P234605	10
Wolf	Peppermint leaf, cut	B-185	5
Wolf	Peppermint leaf, cut	P221379	7
Wolf	Peppermint leaf, cut	B-725	2
Wolf	Peppermint leaf, cut	B243	1
Wolf	Peppermint leaf, cut	B-120	1
Wolf	Peppermint leaf, cut	B725	1
Wolf	Raspberry leaf, cut	P201727	19
Wolf	Raspberry leaf, cut	B-457	1
Wolf	Raspberry leaf, cut	P222676	1
Wolf	Sage leaf, cut	B735	1
Wolf	Shepherd's purse, cut	B449	2
Wolf	St. John's wort, cut	206152	1
Wolf	St. John's wort, cut	19468	2
Wolf	St. John's wort, cut	B-455	2
Wolf	St. John's wort, cut	B-424	2
Wolf	St. John's wort, cut	B206152	1
Wolf	Yarrow herb, cut	230010	1
Wolf	Yarrow herb, cut	B230010	9
Xi'An Chongxin Natura...	Amygdalin	13031401	1
-	Angelica root	130924	1
10.2011	Aniseed	10247201	1
-	Bitter orange flower ...	2011A-01445	1
-	Burdock root, cut	5110I-02131	1
21.08.2013	Calendula flower	1241130321	1
-	Chelidonium majus her...	810I-01632	1
-	Chickweed, cut	2011A-01686	1
-	Chicory herb, cut	4411I-01634	1
-	Elecampane rhizome, cut	712M-02181	1
-	Gentian root, powdered	130063	1
1351 B 111207	Hawthorn flower	1351B111207	4
5N Plus Lübeck GmbH/ ...	Heavy alkaline bismut...	12146908	1
-	Iceland moss, cut	4711E-01774	1
20; 09.11.2013	Marshmallow root, pee...	13057105	1
-	Meadowsweet herb, cut	130849	1
-	Meadowsweet herb, cut	1511M-01685	1
-	Melilot herb, cut	811Q-01664	1
-	Melissa leaf, cut	131146	1
-	Raspberry leaf, cut	130849	1
-	Silverweed, cut	130849	1
-	Silverweed, cut	711M-01619	1
-	Wild thyme, cut	130685	1
-	Wild thyme, cut	131023	1

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Appendix D: Requirements of validation

In order to ensure adherence to the safe scientific status, the individual methods for manufacturing and testing must be validated under certain circumstances (compare § 34 para. 1 no. 3, § 35 para. 1 no. 4 and para. 4 sentence 1 no. 2 b, para. 6 sentence 3 *ApoBetrO* [Pharmacies Rules and Regulations]). The *ApoBetrO* [Pharmacies Rules and Regulations] incorporates a legal definition in § 1 a para. 16 (quotation translated):

> *"Validation is the provision of documented proof which with a high degree of safety documents that, via a specific process or standard work process, a medicinal product is manufactured and tested, which is in accordance with previously determined quality features."*

Validation documentation can be used to prove that methods or devices which are not described in the Pharmacopoeia within the meaning of § 6 para. 1 sentence 3 *ApBetrO* [Pharmacies Rules and Regulations] achieve the same results as those in the Pharmacopoeia. On the other hand, with the requirements of the demanded validation it must be observed whether the respective testing method is already incorporated in the Pharmacopoeia.

NIR spectroscopy as a general testing method need not be validated in accordance with the express ruling in the *Ph. Eur. Section 1.1* [3], as it is already described in *Section 2.2.40* of the *Ph. Eur.* as an area of application for the identification of raw materials.

However, a special validation requirement exists for the reference database. This requirement is met with the existing document. Further requirements or rules as to how this proof must be furnished do not exist. It is required that the processes guarantee the same results as the methods and devices in the Pharmacopoeia [17].

Carrying out identity tests with *Apo-Ident* is therefore also possible if the NIR spectroscopy process is not required in the Pharmacopoeia monograph of the substance for identity testing. All NIR analyses with *Apo-Ident* prove several, often all molecule groups and are therefore comparable with a series of individual, targeted chemical proofs [4]. Therefore, the identity proof with *Apo-Ident* replaces the monograph test series (with two or more test combinations).

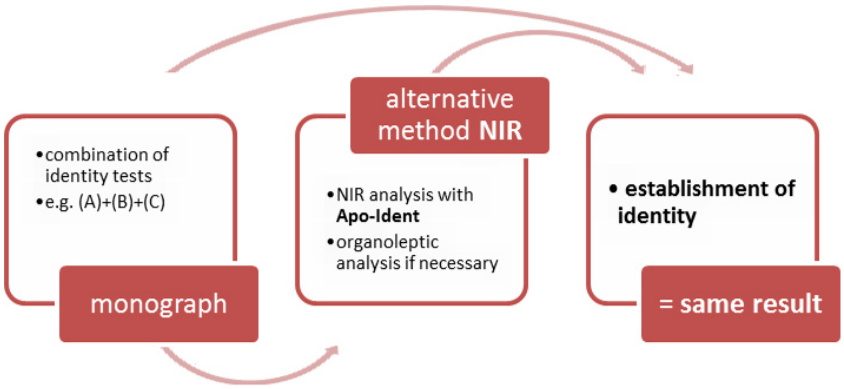


Figure 2: The combination of tests of the monograph is replaced by the alternative method NIR spectroscopy using *Apo-Ident*. This is permissible because both test procedures result in the establishment of the identity of the raw material.

With this validation documentation, proof is furnished that identical results are achieved with *Apo-Ident* and Pharmacopoeia methods, i.e. confirmation of the identity of the raw material [2].

Appendix E: Conformity of *Apo-Ident* with the *European pharmacopeia*

According to *Ph. Eur. Section 2.2.40*, NIR spectroscopy is basically suitable for: "Identification of agents, excipients, dosage forms, intermediate manufacturing products, chemical raw materials and packaging materials" ([3], quotation translated).

The fact that *Apo-Ident* meets the further criteria of the European Pharmacopoeia under the headings in *Section 2.2.40*

- Apparatus
- Measurement methods
- Sample preparation and presentation
- Testing the functionality of the instrument
- Identification and characterisation (qualitative analysis)
- Quantitative analysis
- Ongoing model evaluation
- Transfer of databases
- Data storage

can be proven based on the *HiperScan GmbH* documentation of "Meeting *2.2.40 Ph. Eur.* by *Apo-Ident*" [4].

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Appendix F: Addition to the two-stage models

As described in the general part of the *Apo-Ident* validation documentation, in the section Model creation procedure and validation runs, under *2. Generating the chemometric models (calibration)* in *f)*, it is possible to create a further chemometric model for certain substances (second-stage model) and to undertake the assessment in several steps.

Substances in stage-two models

In the *Apo-Ident Update 2018-04*, a distinction is made between the following substances in the listed stage-two models:

Submodel 1

Bacitracin
Betamethasone, micronized
Betamethasone valerate
Budesonide, micronized
Capsaicin, natural
Dexamethasone
Erythromycin
Hydrocortisone butyrate
Norethisterone acetate
Prednicarbate, micronized
Prednisolone, micronized
Triamcinolone acetonide

Submodel 2

Beclometasone dipropionate, anhydrous
Betamethasone dipropionate, micronized
Clobetasol propionate
Diphenylcyclopropenone
Gentamicin sulfate
Sodium benzoate
Sodium citrate
Oxybutynin hydrochloride

Submodel 3

Alfatradiol
Estriol
Pregnenolone
Progesterone, micronized
Quinine hydrochloride
Quinine sulfate dihydrate
Spironolactone
Testosterone propionate

Liquid submodel

2-ethylhexyl laurate
Base cream DAC
Lanette® ointment (conserved)
Non-ionic hydrophil ointment

Squalane
Wool alcohol cream DAB/SR

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Tetracyclini hydrochloridum, *see* Tetracycline hydrochloride
Tetracyclinum hydrochloricum, *see* Tetracycline hydrochloride
Thalidomide, 1545
Thalidomidum, *see* Thalidomide
Theophylline, 1549
Theophylline-ethylenediamine hydrate, 1553
Theophyllinum, *see* Theophylline
Theophyllinum aethylendiaminum hydricum, *see* Theophylline-ethylenediamine hydrate
Theophyllinum et ethylendiaminum hydricum, *see* Theophylline-ethylenediamine hydrate
Thiamine chloride hydrochloride, 1557
Thiamini hydrochloridum, *see* Thiamine chloride hydrochloride
Threoninum, *see* L-threonine
Thymol, 1561
Thymolum, *see* Thymol
Tobramycin sulfate, 1567
Tobramycin sulphate, *see* Tobramycin sulfate
Tobramycini sulfas, *see* Tobramycin sulfate
Tobramycinum sulfuricum, *see* Tobramycin sulfate
Tosylchloramide sodium, 1571
Tosylchloramidum natricum, *see* Tosylchloramide sodium
Tranexamic acid, 1575
Tretinoin, 1579
Tretinoinum, *see* Tretinoin
Triamcinolon, micronized, 1587
Triamcinolone acetonide, 1591
Triamcinoloni acetonidum, *see* Triamcinolone acetonide
Triamcinolonum acetonatum, *see* Triamcinolone acetonide
Triamcinolonum micronisatum, *see* Triamcinolon, micronized
Triclosan, 1605
Triclosanum, *see* Triclosan
Tritici amylum, *see* Starch
Trometamol, 1619
Trometamolum, *see* Trometamol
Tropicamide, 1625
Tropicamidum, *see* Tropicamide
Tryptophanum, *see* L-tryotophan
Tyrosine, 1629
Tyrosinum, *see* Tyrosine
Tyrothricin, 1633
Tyrothricinum, *see* Tyrothricin

Ubidecarenone, 1637
Ubidecarenonum, *see* Ubidecarenone
Urea, 1641
Urea pura, *see* Urea
Ureum, *see* Urea
Uridine, 1653
Uridinum, *see* Uridine

Valine, 1657
Valinum, *see* Valine
Vancomycin hydrochloride, 1661
Vancomycini hydrochloridum, *see* Vancomycin hydrochloride
Vanillin, 1665
Vanillinum, *see* Vanillin

Wax, bleached, *see* Waxes / Fats
Wax, yellow, *see* Waxes / Fats
Waxes / Fats, 1671
Wheat starch, *see* Starch
Wool alcohols, 1689

Xylitol, 1693
Xylitolum, *see* Xylitol
Xylometazoline hydrochloride, 1697
Xylometazolini hydrochloridum, *see* Xylometazoline hydrochloride
Xylometazolinum hydrochloricum, *see* Xylometazoline hydrochloride
Xylose, 1703
Xylosum, *see* Xylose

Zinc acetate dihydrate, 1707
Zinc gluconate, 1711
Zinci acetas dihydricus, *see* Zinc acetate dihydrate
Zinci gluconas, *see* Zinc gluconate
Zincum aceticum purum, *see* Zinc acetate dihydrate
Zincum gluconicum, *see* Zinc gluconate