

Validation documentation
APIs & excipients, liquid/semi-solid (other)

HiperScan GmbH

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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-intensive, time-intensive 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 transfection.
- 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, liquid/semi-solid (other)*.

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, liquid/semi-solid (other)*. 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.

- 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. Bezugsquellen-nachweis 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.

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, liquid/semi-solid (other)* 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 themselves 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 14000 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.

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 Pharmacopoeia* 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-

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

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

[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 $\mathbf{X}$.

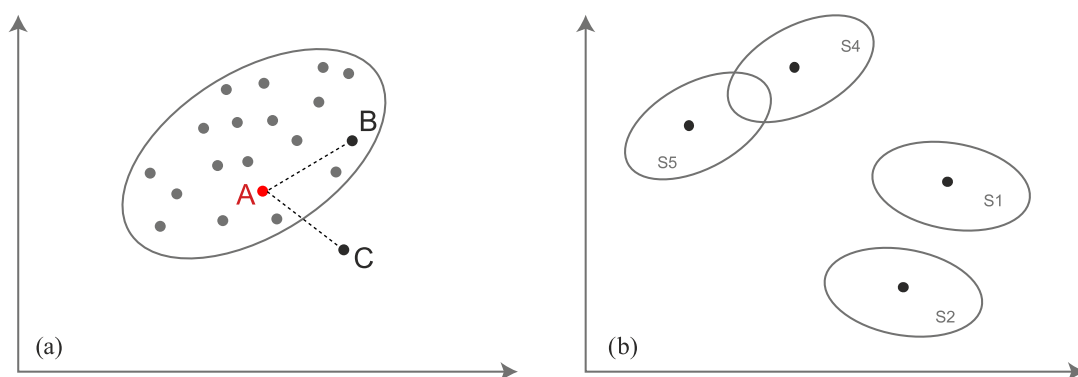


Figure 1: (a) The *Mahalanobis distance* from *A* to *B* is less than from *A* to *C*. However, the Euclidean distances are identical. (b) The *Mahalanobis distance* between the two measurement series *S4* and *S5* is smaller than between *S1* and *S2*. However, the Euclidean distances are identical.

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.

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 48 238 spectra from 2923 different batches for a total of 208 substances were used to validate the substance class *APIs & excipients, liquid/semi-solid (other)*.

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, liquid/semi-solid (other)	159	489	20 678

From category *A* a total of 20 678 spectra from 489 batches for a total of 159 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, liquid/semi-solid (other)	204	578	23 348

From category *B* a total of 23 348 spectra from 578 batches for a total of 204 substances were taken into account for validation.

Type C Spectra from independent samples which are not included in database generation. *Apo-Ident* 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, liquid/semi-solid (other)	135	2153	4212

From category *C* a total of 4212 spectra from 2153 batches for a total of 135 substances were taken into account for validation.

Validation results

The validation runs checked whether all substances/substance groups in the substance class *APIs & excipients, liquid/semi-solid (other)* 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, liquid/semi-solid (other)* 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	20 678	0	2 047 122
Type B	0	18 773	1165	2 313 747
Type C	0	3849	223	417 089

All substances/substance groups in the substance class *APIs & excipients, liquid/semi-solid (other)* 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 56 %)	100.000 00 % (> 99.955 53 %)
Type B	100.000 00 % (> 99.999 51 %)	93.088 57 % (> 93.062 17 %)
Type C	100.000 00 % (> 99.985 47 %)	90.519 86 % (> 89.891 30 %)

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

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Alfason Basis Cresa[®]**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 30723-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Alfason Basis Cresa[®]

Special notes

When selecting the *Alfason Basis Cresa[®]* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Alfason Basis Cresa[®]*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Astellas Pharma	Alfason Basis Cr...	12B11/77	30723	50	not required
Astellas Pharma	Alfason Basis Cr...	13D06/75	31071	40	not required
Astellas Pharma	Alfason Basis Cr...	15I46/79	32064	40	not required
Astellas Pharma	Alfason Basis Cr...	16D35/77	32815	40	not required

Validation samples

A total of 48 238 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 170 spectra of 4 reference samples from the substance/substance group *Alfason Basis Cresa*[®]. These samples are listed above in the [calibration samples](#) section.
- 20 508 spectra from a total of 482 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 104 spectra of 4 reference samples from the substance/substance group *Alfason Basis Cresa*[®].

Supplier	Substance	Batch	Sample ID	Spectra
Astellas Pharma	Alfason Basis Cresa [®]	12B11/77	30723 [†]	4
Astellas Pharma	Alfason Basis Cresa [®]	15I46/79	32064 [†]	20
Astellas Pharma	Alfason Basis Cresa [®]	16D35/77	32840	40
LEO Pharma GmbH	Alfason Basis Cresa [®]	17B27/75	33487	40

- 23 244 spectra from a total of 574 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 39 spectra from 13 *Apo-Ident* customers from 23 batches from the substance/substance group *Alfason Basis Cresa*[®].

[†]These spectra were recorded from 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
Sanacorp	Alfason Basis Cresa [®]	12F23/76	1
A.H.D.	Alfason Basis Cresa [®]	12/05/75	1
AHD	Alfason Basis Cresa [®]	13A18/76	1
Sanacorp	Alfason Basis Cresa [®]	13A16/76	1
Sanacorp	Alfason Basis Cresa [®]	13E08/75	1
Ichtyol/Phönix	Alfason Basis Cresa [®]	13E08/75	1
Astellas	Alfason Basis Cresa [®]	13A16/76	1
Astellas Pharma	Alfason Basis Cresa [®]	13K15/75	2
Astellas	Alfason Basis Cresa [®]	14c32-78	1
AStellas	Alfason Basis Cresa [®]	14J02/77	1
Astellas Pharma	Alfason Basis Cresa [®]	14C32/78	1
Astellas	Alfason Basis Cresa [®]	14J02/77	1
Astellas Pharma	Alfason Basis Cresa [®]	14J02/77	2
Astellas / Noweda	Alfason Basis Cresa [®]	14J02/77	1
Astellas Pharma	Alfason Basis Cresa [®]	15D11/79	3
Astellas / Noweda	Alfason Basis Cresa [®]	15D11/79	2
Astellas / Noweda	Alfason Basis Cresa [®]	15D1179	1
Caeo/Noweda	Alfason Basis Cresa [®]	15H06/80	1
Noweda-Astella	Alfason Basis Cresa [®]	15A01/79	1
Astellas / Noweda	Alfason Basis Cresa [®]	15J35/76	1
Astellas Pharma	Alfason Basis Cresa [®]	16A06/76	1
Astellas Pharma	Alfason Basis Cresa [®]	15H06/80	1
Lamotte/ Noweda	Alfason Basis Cresa [®]	16A06/76	2
Astellas Pharma/Noweda	Alfason Basis Cresa [®]	15J38/79	1
Astellas / Anzag	Alfason Basis Cresa [®]	15J3/79	1
Astellas Pharma GmbH/ A...	Alfason Basis Cresa [®]	16D35/77	1
Caelo	Alfason Basis Cresa [®]	17EB/75	1
Leo/ Phönix	Alfason Basis Cresa [®]	17F08/76	2
LEO Pharma / Alliance H...	Alfason Basis Cresa [®]	17F20/76	1
Leo/ Phönix	Alfason Basis Cresa [®]	17F46/76	2
Leo Pharma/Gehe	Alfason Basis Cresa [®]	18A29/75	1

- 4173 spectra from 395 *Apo-Ident* customers from a total of 2088 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	170	0	20 508
Type B	0	104	0	23 244
Type C	0	39	0	4173

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9554 %)	100.0000 % (> 96.4706 %)
Type B	100.0000 % (> 99.9509 %)	100.0000 % (> 94.2308 %)
Type C	100.0000 % (> 98.5363 %)	100.0000 % (> 84.6154 %)

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

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

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

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
32064	32064	0.00	24.52
30723	30723	0.00	21.73
31071	31071	0.00	20.23
32815	32815	0.00	19.69

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Allergika evening primrose oil cream 20% / Dermi...**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 30970-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Allergika evening primrose oil cream 20% / Dermifant[®] kids cream; Allergika evening primrose oil cream 20%; Dermifant[®] kids cream

Special notes

When selecting the *Allergika evening primrose oil cream 20% / Dermifant[®] kids cream* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Allergika evening primrose oil cream 20% / Dermifant[®] kids cream*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Allergika	Dermifant [®] kids ...	1210082	30970	80	not required
Allergika	Dermifant [®] kids ...	1303033	31062	40	not required
Allergika	Allergika evenin...	1504021	31725	40	not required
Allergika	Allergika evenin...	1511051	31871	40	not required
Allergika	Allergika evenin...	1609043	33486	40	not required
Allergika	Dermifant [®] kids ...	1705043	33639	40	not required

Validation samples

A total of 48 238 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 280 spectra of 6 reference samples from the substance/substance group *Allergika evening primrose oil cream 20% / Dermifant[®] kids cream*. These samples are listed above in the [calibration samples](#) section.
- 20 398 spectra from a total of 480 batches from further 157 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 200 spectra of 6 reference samples from the substance/substance group *Allergika evening primrose oil cream 20% / Dermifant[®] kids cream*.

Supplier	Substance	Batch	Sample ID	Spectra
Allergika	Allergika evening primrose o...	1504021	31725 [†]	20
Allergika	Allergika evening primrose o...	1511051	31871 [†]	20
Allergika	Dermifant [®] kids cream	1607032	32754	40
Allergika	Allergika evening primrose o...	1607031	32756	40
Allergika	Allergika evening primrose o...	1410062	32909	40
Allergika	Dermifant [®] kids cream	1801010	34033	40

- 23 148 spectra from a total of 572 batches from further 202 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

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

- 13 spectra from 2 *Apo-Ident* customers from 8 batches from the substance/substance group *Allergika evening primrose oil cream 20% / Dermifant[®] kids cream*.

Supplier	Substance	Batch	Spectra
Phönix	Dermifant [®] kids cream	1312102	2
Gehe	Dermifant [®] kids cream	1407053	1
Allergika Pharma GmbH	Dermifant [®] kids cream	1410072	1
WE:Phoenix 10.12.2016 ...	Dermifant [®] kids cream	1609042	1
Sanacorp WE: 01.09.17 ...	Dermifant [®] kids cream	1705043	1
Phönix EK:10,19 EUR ...	Dermifant [®] kids cream	1703024	1
Sanacorp WE: 09.11.17 1...	Dermifant [®] kids cream	1708063	2
Sanacorp7Mida WE:13.01...	Dermifant [®] kids cream	1711094	4

- 4199 spectra from 396 *Apo-Ident* customers from a total of 2103 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Allergika evening primrose oil cream 20% / Dermifant[®] kids cream* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Allergika evening primrose oil cream 20% / Dermifant[®] kids cream* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 398
Type B	0	200	0	23 148
Type C	0	13	0	4199

The substance/substance group *Allergika evening primrose oil cream 20% / Dermifant[®] kids cream* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9553 %)	100.0000 % (> 97.8571 %)
Type B	100.0000 % (> 99.9508 %)	100.0000 % (> 97.0000 %)
Type C	100.0000 % (> 98.5400 %)	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
30970	30970	0.00	17.63
31062	31062	0.00	21.53
33639	33639	0.00	18.44
31725	31725	0.00	19.66
31871	31871	0.00	17.89
33486	33486	0.00	18.00

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **alpha-bisabolol (racemic) at least 85%**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 31464-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

alpha-bisabolol (racemic) at least 85%

Special notes

When selecting the *alpha-bisabolol (racemic) at least 85%* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan 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-bisabolol (racemic) at least 85%*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	alpha-bisabolol ...	13360114	31464	40	not required
Caelo	alpha-bisabolol ...	13360114	31465	40	not required

Validation samples

A total of 48 238 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 *alpha-bisabolol (racemic)* at least 85%. These samples are listed above in the [calibration samples](#) section.
- 20 598 spectra from a total of 485 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 160 spectra of 5 reference samples from the substance/substance group *alpha-bisabolol (racemic)* at least 85%.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	alpha-bisabolol (racemic) at...	13360114	31464 [†]	20
Caelo	alpha-bisabolol (racemic) at...	13360114	31465 [†]	20
Caelo	alpha-bisabolol (racemic) at...	16271902	32782	40
Caelo	alpha-bisabolol (racemic) at...	17065801	33417	40
Caelo	alpha-bisabolol (racemic) at...	180585	34227	40

- 23 188 spectra from a total of 574 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 1 spectra from 1 *Apo-Ident* customers from 1 batches from the substance/substance group *alpha-bisabolol (racemic)* at least 85%.

[†]These spectra were recorded from 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	alpha-bisabolol (racemic) at...	14322713	1

- 4211 spectra from 396 *Apo-Ident* customers from a total of 2110 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance 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-bisabolol (racemic) at least 85%* can clearly be 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-bisabolol (racemic) at least 85%* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 598
Type B	0	160	0	23 188
Type C	0	1	0	4211

The substance/substance group *alpha-bisabolol (racemic) at least 85%* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9558 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9508 %)	100.0000 % (> 96.2500 %)
Type C	100.0000 % (> 98.6061 %)	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
31464	31464	0.00	51.61
31465	31465	0.00	51.84

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Angelica root oil**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 30535-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Angelica root oil; Oleum angelicae (e radice)

Special notes

When selecting the *Angelica root oil* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Angelica root oil*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Taoasis	Angelica root oil	33019-109871BAG90451	30964	40	not required
Taoasis	Angelica root oil	4053-116078	31682	40	not required
Taoasis	Angelica root oil	2829199-122587	31780	40	not required
Taoasis	Angelica root oil	3029209-123992	32068	40	not required

Validation samples

A total of 48 238 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 *Angelica root oil*. These samples are listed above in the [calibration samples](#) section.
- 20 518 spectra from a total of 482 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 140 spectra of 5 reference samples from the substance/substance group *Angelica root oil*.

Supplier	Substance	Batch	Sample ID	Spectra
Taoasis	Angelica root oil	4053-116078	31682 [†]	20
Taoasis	Angelica root oil	2829199-122587	31780 [†]	20
Taoasis	Angelica root oil	3029209-123992	32068 [†]	20
Taoasis	Angelica root oil	3029209-125059	32477	40
Taoasis	Angelica root oil	1839219-127663	33644	40

- 23 208 spectra from a total of 573 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 5 spectra from 5 *Apo-Ident* customers from 5 batches from the substance/substance group *Angelica root oil*.

[†]These spectra were recorded from 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	Angelica root oil	11352704	1
Caelo	Angelica root oil	11352706	1
Taoasis	Angelica root oil	33019-110236BAG904	1
Taoasis	Angelica root oil	4053-117762	1
Taoasis	Angelica root oil	129271	1

- 4207 spectra from 396 *Apo-Ident* customers from a total of 2106 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Angelica root oil* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Angelica root oil* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 518
Type B	0	140	0	23 208
Type C	0	3	2	4207

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9555 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9508 %)	100.0000 % (> 95.7143 %)
Type C	100.0000 % (> 98.5488 %)	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
31780	31780	0.00	33.00
32068	32068	0.00	27.57
30964	30964	0.00	32.13
31682	31682	0.00	27.42

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group	Aqueous ointments
Substance class	APIs & excipients, liquid/semi-solid (other)
Report date	24/05/2019
Report number	30726-2019-05-24
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Aqueous ointments; Dermatest base ointment; Excipial[®] lipo cream; Fabitop[®] base cream

Special notes

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

no information

Applicable documents

978-3-7692-6679-5	<i>European Pharmacopoeia 9th Edition, Basic Version 2017</i> [3]
Komm2.2.40	<i>Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident</i> [4]
AA004	<i>Erstellung und Validierung eines IdentModul-Updates</i>
Appendix F	Addition to the second-stage models

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Aqueous ointments*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Spirig Pharma	Excipial [®] lipo c...	I011	30726	40	not required
Fontapharm	Fabitop [®] base cr...	6RWW2	31082	40	not required
Spirig Pharma	Excipial [®] lipo c...	N017	31088	40	not required
Spirig Pharma	Excipial [®] lipo c...	R011	31520	40	not required
Fontapharm	Fabitop [®] base cr...	GWWL3	31576	40	not required

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
P&M Cosmetics	Dermatest base o...	251115	31627	40	not required
P&M Cosmetics	Dermatest base o...	180317	31950	40	not required
P&M Cosmetics	Dermatest base o...	121217	33039	40	not required
Spirig Pharma	Excipial [®] lipo c...	T081	33207	40	not required
Fontapharm	Fabitor [®] base cr...	GLWD5	33221	40	not required
Galderma Labo...	Excipial [®] lipo c...	V051	33636	40	not required

Validation samples

A total of 48 238 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 *Aqueous ointments*. These samples are listed above in the [calibration samples](#) section.
- 20 238 spectra from a total of 475 batches from further 156 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 380 spectra of 12 reference samples from the substance/substance group *Aqueous ointments*.

Supplier	Substance	Batch	Sample ID	Spectra
P&M Cosmetics	Dermatest base ointment	120911	30737	40
Fontapharm	Fabitor [®] base cream	GRWW1	30835	40
P&M Cosmetics	Dermatest base ointment	070615	31053	20
Spirig Pharma	Excipial [®] lipo cream	N017	31276	40
P&M Cosmetics	Dermatest base ointment	231115	31288	40
Spirig Pharma	Excipial [®] lipo cream	R011	31520 [†]	20
Fontapharm	Fabitor [®] base cream	GWWL3	31576 [†]	20
P&M Cosmetics	Dermatest base ointment	251115	31627 [†]	20
P&M Cosmetics	Dermatest base ointment	180317	31950 [†]	20
Galderma Laboratorium G...	Excipial [®] lipo cream	V051	33637	40
Fontapharm	Fabitor [®] base cream	GLWD4	33869	40
P&M Cosmetics	Dermatest base ointment	260820	34032	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*.

- 22968 spectra from a total of 566 batches from further 201 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 216 spectra from 42 *Apo-Ident* customers from 72 batches from the substance/substance group *Aqueous ointments*.

Supplier	Substance	Batch	Spectra
Caelo	Fabitop [®] base cream	GWWL1	1
Artesan	Fabitop [®] base cream	GLWW5	1
jenne artesan	Fabitop [®] base cream	GLWWW5	1
Fontapharm	Fabitop [®] base cream	GLWW4	1
Jenne	Fabitop [®] base cream	GWWL1	1
Gehe	Fabitop [®] base cream	GRWW2	6
Phönix/Fontapharm	Fabitop [®] base cream	GRWW2	1
Fontapharm	Fabitop [®] base cream	GLWD2	7
Caelo	Fabitop [®] base cream	glwd2	1
Fontapharm	Fabitop [®] base cream	GLWD2x2	1
Fontapharm/Gehe	Fabitop [®] base cream	GLWD4	1
Fontapharm	Fabitop [®] base cream	GLWD5	1
Fontapharm	Fabitop [®] base cream	101601	1
THC/Noweda	Fabitop [®] base cream	1016022	1
spirig	Excipial [®] lipo cream	M016	4
spirig	Excipial [®] lipo cream	M017	1
spirig	Excipial [®] lipo cream	M041	5
Spirig	Excipial [®] lipo cream	K021	1
Sanacorp	Excipial [®] lipo cream	M027	1
Spirig/Phönix	Excipial [®] lipo cream	4622	1
Spirig/AHD	Excipial [®] lipo cream	M017	1
Spirig/AHD	Excipial [®] lipo cream	M041	2
Spirig Pharma	Excipial [®] lipo cream	813994/09	2
Spirig / Anzag	Excipial [®] lipo cream	M017	1
Spirig / Anzag	Excipial [®] lipo cream	813994/09	1
Spirig/Phoenix	Excipial [®] lipo cream	M042	2
Spirig / Anzag	Excipial [®] lipo cream	M042	3
spirig	Excipial [®] lipo cream	813994/09	1
Spirig / Anzag	Excipial [®] lipo cream	N018	3
Sanacorp	Excipial [®] lipo cream	LOTN016	1
spirig	Excipial [®] lipo cream	M042	2
Spirig/AHD	Excipial [®] lipo cream	N018	2
spirig	Excipial [®] lipo cream	N018	4
Alliance Healthcare	Excipial [®] lipo cream	M045	1
Spirig Pharma AG	Excipial [®] lipo cream	M042	1
Alliance Healthcare	Excipial [®] lipo cream		1
Spirig / Anzag	Excipial [®] lipo cream	N018	1
spirig	Excipial [®] lipo cream	N021	5
Spirig	Excipial [®] lipo cream	N021	1
Spirig /Gehe	Excipial [®] lipo cream	LOTN021	2
Spirig /Gehe	Excipial [®] lipo cream	LOTR012	1
Spirig	Excipial [®] lipo cream	R012	4
Spirig / Anzag	Excipial [®] lipo cream	LOTN021	2
Gehe	Excipial [®] lipo cream	N061	1

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Supplier	Substance	Batch	Spectra
Anzag/ Chiesi	Excipial [®] lipo cream	LOTR012	2
spirig	Excipial [®] lipo cream		1
Spirig Pharma AG/GEHE	Excipial [®] lipo cream	R012	1
Spirig Pharma AG/Allian. . .	Excipial [®] lipo cream	N018	1
Spirig Pharma Europe GmbH	Excipial [®] lipo cream	R026	1
spirig	Excipial [®] lipo cream	R012	3
Spirig /Gehe	Excipial [®] lipo cream	R012	1
Galderma	Excipial [®] lipo cream	N061	2
spirig	Excipial [®] lipo cream	N061	2
Spirig/Gehe	Excipial [®] lipo cream	R012	1
Galderma	Excipial [®] lipo cream	R026	2
Galderma	Excipial [®] lipo cream	R012	1
Galderma/Phönix	Excipial [®] lipo cream	R042	1
Galderma/Galderma	Excipial [®] lipo cream	R026	1
Galderma	Excipial [®] lipo cream	R042	1
Galderma/Galderma	Excipial [®] lipo cream	ro26	1
Galderma/Galderma	Excipial [®] lipo cream	R042	9
Galderma	Excipial [®] lipo cream	R035	2
Galderma/Phönix	Excipial [®] lipo cream	R026	2
Spirig/Phönix	Excipial [®] lipo cream	R042	1
Galderma/Gehe	Excipial [®] lipo cream	R042	2
Wolff	Excipial [®] lipo cream	S031	1
Galderma/Phönix	Excipial [®] lipo cream	R012	1
Caelo	Excipial [®] lipo cream	LOTS023	1
Galderma/Galderma	Excipial [®] lipo cream	S023	8
Galderma/Anzag	Excipial [®] lipo cream	S011	1
spirig	Excipial [®] lipo cream	r042	1
Gehe/Galderma	Excipial [®] lipo cream	LOTS031	1
Spirig/Anzag	Excipial [®] lipo cream	S023	1
Spirig/Anzag	Excipial [®] lipo cream	S031	1
Phönix/Galderma	Excipial [®] lipo cream	S023	1
Spirig/Anzag	Excipial [®] lipo cream	R011	1
Galderma/ Noweda	Excipial [®] lipo cream	s023	6
Galderma/Galderma	Excipial [®] lipo cream	T021	8
Galderma/ Noweda	Excipial [®] lipo cream	S031	9
Galderma/Phönix	Excipial [®] lipo cream	S031	1
Caelo	Excipial [®] lipo cream	9031	1
Galderma/ Noweda	Excipial [®] lipo cream	t022	5
Galderma	Excipial [®] lipo cream	LOTS032	1
Galderma/Phönix	Excipial [®] lipo cream	S023	1
Galderma/Phönix	Excipial [®] lipo cream	T021	1
Galderma	Excipial [®] lipo cream	T021	2
Galderma/ Noweda	Excipial [®] lipo cream	T022	4
Galderma	Excipial [®] lipo cream	T061	2
Galderma/ Noweda	Excipial [®] lipo cream	T021	5
Galderma/Noweda	Excipial [®] lipo cream	170420EL/LOTT021	1
Spirig (Galderma)	Excipial [®] lipo cream	T061	1
Galderma/Phönix WE: 03...	Excipial [®] lipo cream	LOTV012	1
Galderma/Noweda	Excipial [®] lipo cream	T021	1
Galderma	Excipial [®] lipo cream	V051	1
Galderma/Noweda	Excipial [®] lipo cream	171819E/LOTT021	1
Galderma	Excipial [®] lipo cream	v042	1
Galderma/Noweda	Excipial [®] lipo cream	V051	1
Caelo	Excipial [®] lipo cream	V051	1
Spirig Pharma	Excipial [®] lipo cream	T021	1
Galderma	Excipial [®] lipo cream	V091	1
Galderma/Gehe	Excipial [®] lipo cream	V091	1
Caelo	Excipial [®] lipo cream	V112	3
Galderma/Noweda	Excipial [®] lipo cream	180208L/LOTV091	1
Galmeda Noweda	Excipial [®] lipo cream	180504EL/LOTV112	1

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Supplier	Substance	Batch	Spectra
Noweda/ Galderma	Excipial [®] lipo cream	V112180607EL	1
Galderma/Noweda	Excipial [®] lipo cream	50567	1
Galderma /AHD	Excipial [®] lipo cream	50567	3
Galderma /AHD	Excipial [®] lipo cream	8769004	1
Sanacorp	Dermatest base ointment	70615	1
P&M Cosmetics/Anzag	Dermatest base ointment	122631	1
P&M	Dermatest base ointment	241115	1
Leyh GmbH	Dermatest base ointment	121217	1
P&M Cosmetics	Dermatest base ointment	210915	1
Caelo	Dermatest base ointment	121217	1
P&M Cosmetics/Alliance ...	Dermatest base ointment	152241	1
p&m cosmetics/gehe	Dermatest base ointment	200419	1

- 3996 spectra from 395 *Apo-Ident* customers from a total of 2048 batches from a further 132 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Aqueous ointments* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Aqueous ointments* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 238
Type B	0	308	72	22 878
Type C	0	182	34	3986

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9552 %)	100.0000 % (> 98.6364 %)
Type B	100.0000 % (> 99.9510 %)	81.0526 % (> 80.2632 %)
Type C	100.0000 % (> 98.5419 %)	84.2593 % (> 82.8704 %)

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

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

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

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
31576	31576	0.00	20.40
31627	31627	0.00	20.60
31950	31950	0.00	21.98
33039	33039	0.00	21.15
33221	33221	0.00	23.91
31082	31082	0.00	23.83
31088	31088	0.00	51.52
31520	31520	0.00	51.86
33207	33207	0.00	45.59
33636	33636	0.00	58.02
30726	30726	0.00	53.32

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Argan oil**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 32168-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Argan oil; Oleum Arganiae

Special notes

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

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Argan oil*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Argan oil	161443	32168	40	-*
Caelo	Argan oil	16035101	32571	40	not required

Validation samples

A total of 48 238 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 *Argan oil*. These samples are listed above in the [calibration samples](#) section.
- 20 598 spectra from a total of 484 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 100 spectra of 3 reference samples from the substance/substance group *Argan oil*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Argan oil	161443	32168 [†]	20
Caelo	Argan oil	16035101	32306	40
Caelo	Argan oil	162759	32679	40

- 23 248 spectra from a total of 575 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

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

*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*.

- 4212 spectra from 396 *Apo-Ident* customers from a total of 2111 batches from a further 135 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Argan oil* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Argan oil* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 598
Type B	0	100	0	23 248
Type C	0	0	0	4212

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9558 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9509 %)	100.0000 % (> 94.0000 %)
Type C	100.0000 % (> 98.5344 %)	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
32168	32168	0.00	18.80
32571	32571	0.00	15.73

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Balm Bio Nature**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 31645-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Balm Bio Nature

Special notes

When selecting the *Balm Bio Nature* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Balm Bio Nature*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Taoasis	Balm Bio Nature	150422-5106	31645	40	not required
Taoasis	Balm Bio Nature	150422-5106	31724	40	not required
Taoasis	Balm Bio Nature	151210-5337	32994	40	not required
Taoasis	Balm Bio Nature	180515-8060	34115	40	not required

Validation samples

A total of 48 238 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 *Balm Bio Nature*. These samples are listed above in the [calibration samples](#) section.
- 20 518 spectra from a total of 483 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 120 spectra of 4 reference samples from the substance/substance group *Balm Bio Nature*.

Supplier	Substance	Batch	Sample ID	Spectra
Taoasis	Balm Bio Nature	150422-5106	31645 [†]	20
Taoasis	Balm Bio Nature	150422-5106	31724 [†]	20
Taoasis	Balm Bio Nature	160401-6083	32786	40
Taoasis	Balm Bio Nature	170403-7087	33436	40

- 23 228 spectra from a total of 575 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 12 spectra from 2 *Apo-Ident* customers from 1 batches from the substance/substance group *Balm Bio Nature*.

[†]These spectra were recorded from 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
Taoasis	Balm Bio Nature	151210-5337	12

- 4200 spectra from 396 *Apo-Ident* customers from a total of 2110 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Balm Bio Nature* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Balm Bio Nature* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 518
Type B	0	120	0	23 228
Type C	0	12	0	4200

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9555 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9508 %)	100.0000 % (> 95.0000 %)
Type C	100.0000 % (> 98.5404 %)	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
32994	32994	0.00	9.99
34115	34115	0.00	19.16
31645	31645	0.00	18.01
31724	31724	0.00	21.91

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Banana aroma**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 31105-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Banana aroma; Banana flavour

Special notes

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

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Banana aroma*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Banana aroma	12302509	31105	40	1404166
Caelo	Banana aroma	14353702	31606	40	not required
Caelo	Banana aroma	171890	33687	40	20170707*

Validation samples

A total of 48 238 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 *Banana aroma*. These samples are listed above in the [calibration samples](#) section.
- 20 558 spectra from a total of 483 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 100 spectra of 3 reference samples from the substance/substance group *Banana aroma*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Banana aroma	14353702	31606 [†]	20
Caelo	Banana aroma	16089305	33496	40
Caelo	Banana aroma	16089305	33608	40

- 23 248 spectra from a total of 576 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 7 spectra from 5 *Apo-Ident* customers from 6 batches from the substance/substance group *Banana aroma*.

*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*.

Supplier	Substance	Batch	Spectra
Caelo	Banana aroma	12302509	1
Caelo	Banana aroma	14353707	1
Caelo	Banana aroma	16089304	2
Caelo	Banana aroma	16089305	1
Caelo	Banana aroma	14353709	1
Caelo	Banana aroma	17189001	1

- 4205 spectra from 396 *Apo-Ident* customers from a total of 2105 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Banana aroma* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Banana aroma* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 558
Type B	0	100	0	23 248
Type C	0	7	0	4205

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9556 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9509 %)	100.0000 % (> 94.0000 %)
Type C	100.0000 % (> 98.5447 %)	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
31105	31105	0.00	149.59
31606	31606	0.00	148.68
33687	33687	0.00	147.69

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Basil oil**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 30751-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Basil oil; Oleum ocimum basilicum

Special notes

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

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Basil oil*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Taoasis	Basil oil	561-119057	31755	40	not required
Taoasis	Basil oil	1500312-128851	33725	40	not required

Validation samples

A total of 48 238 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 *Basil oil*. These samples are listed above in the [calibration samples](#) section.
- 20 598 spectra from a total of 484 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 140 spectra of 4 reference samples from the substance/substance group *Basil oil*.

Supplier	Substance	Batch	Sample ID	Spectra
Taoasis	Basil oil	21022-108746BAG90451	30751	40
Taoasis	Basil oil	561-119057	31755 [†]	20
Taoasis	Basil oil	1500312-126393	32972	40
Taoasis	Basil oil	1500312-126393	32973	40

- 23 208 spectra from a total of 575 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 0 spectra from 0 *Apo-Ident* customers from 0 batches from the substance/substance group *Basil oil*.
- 4212 spectra from 396 *Apo-Ident* customers from a total of 2111 batches from a further 135 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented

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

within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Basil oil* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Basil oil* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 598
Type B	0	140	0	23 208
Type C	0	0	0	4212

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9558 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9508 %)	100.0000 % (> 95.7143 %)
Type C	100.0000 % (> 98.5344 %)	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
31755	31755	0.00	148.84
33725	33725	0.00	159.63

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Benzoin siam oil 20%**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 30456-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Benzoin siam oil 20%; Oleum styrax tonkinensis

Special notes

When selecting the *Benzoin siam oil 20%* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Benzoin siam oil 20%*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Taoasis	Benzoin siam oil...	12990-114892	31256	40	not required
Taoasis	Benzoin siam oil...	51939-123084	31843	40	not required
Taoasis	Benzoin siam oil...	63287-126233	32974	40	not required
Taoasis	Benzoin siam oil...	2161-1395	33855	40	not required
Taoasis	Benzoin siam oil...	32105-119788BAG90451	33944	40	not required

Validation samples

A total of 48 238 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 *Benzoin siam oil 20%*. These samples are listed above in the [calibration samples](#) section.
- 20 478 spectra from a total of 481 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 100 spectra of 3 reference samples from the substance/substance group *Benzoin siam oil 20%*.

Supplier	Substance	Batch	Sample ID	Spectra
Taoasis	Benzoin siam oil 20%	51939-123084	31843 [†]	20
Taoasis	Benzoin siam oil 20%	63287-126233	33028	40
Taoasis	Benzoin siam oil 20%	2010-836	33724	40

- 23 248 spectra from a total of 575 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 16 spectra from 7 *Apo-Ident* customers from 15 batches from the substance/substance group *Benzoin siam oil 20%*.

[†]These spectra were recorded from 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
Taoasis	Benzoin siam oil 20%	474084-96350	1
Taoasis	Benzoin siam oil 20%	518434-108321	1
Taoasis	Benzoin siam oil 20%	541389-111081	1
Taoasis	Benzoin siam oil 20%	548481-111780	1
Taoasis	Benzoin siam oil 20%	548442-113119	1
Taoasis	Benzoin siam oil 20%	23478-116955	2
Taoasis	Benzoin siam oil 20%	17578-116819	1
Taoasis	Benzoin siam oil 20%	31343-118365	1
Taoasis	Benzoin siam oil 20%	41242-120661	1
Taoasis	Benzoin siam oil 20%	41242-121512	1
Taoasis	Benzoin siam oil 20%	51939-123084	1
Taoasis	Benzoin siam oil 20%	59023-125420	1
Taoasis	Benzoin siam oil 20%	54125	1
Taoasis	Benzoin siam oil 20%	62330-124547	1
Taoasis	Benzoin siam oil 20%	63287-126233	1

- 4196 spectra from 396 *Apo-Ident* customers from a total of 2096 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Benzoin siam oil 20%* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Benzoin siam oil 20%* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 478
Type B	0	84	16	23 248
Type C	0	15	1	4196

The substance/substance group *Benzoin siam oil 20%* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9554 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9509 %)	84.0000 % (> 81.0000 %)
Type C	100.0000 % (> 98.5389 %)	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
31256	31256	0.00	91.94
31843	31843	0.00	92.36
32974	32974	0.00	96.72
33944	33944	0.00	101.19
33855	33855	0.00	98.96

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group	Bepanthen® Wund- und Heilsalbe
Substance class	APIs & excipients, liquid/semi-solid (other)
Report date	24/05/2019
Report number	31048-2019-05-24
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Bepanthen® Wund- und Heilsalbe

Special notes

When selecting the *Bepanthen® Wund- und Heilsalbe* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-6679-5	<i>European Pharmacopoeia 9th Edition, Basic Version 2017</i> [3]
Komm2.2.40	<i>Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident</i> [4]
AA004	<i>Erstellung und Validierung eines IdentModul-Updates</i>
Appendix F	Addition to the second-stage models

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Bepanthen® Wund- und Heilsalbe*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Bayer	Bepanthen® Wund-...	GP00LB9	31048	40	not required
Bayer	Bepanthen® Wund-...	GP012SS	31758	40	not required
Bayer	Bepanthen® Wund-...	GP01CTH	33613	40	not required

Validation samples

A total of 48 238 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 *Bepanthen[®] Wund- und Heilsalbe*. These samples are listed above in the [calibration samples](#) section.
- 20 558 spectra from a total of 483 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 100 spectra of 3 reference samples from the substance/substance group *Bepanthen[®] Wund- und Heilsalbe*.

Supplier	Substance	Batch	Sample ID	Spectra
Bayer	Bepanthen [®] Wund- und Heilsalbe	GP012SS	31758 [†]	20
Bayer	Bepanthen [®] Wund- und Heilsalbe	GP018T5	32720	40
Bayer	Bepanthen [®] Wund- und Heilsalbe	GP019ZF	32948	40

- 23 248 spectra from a total of 575 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 2 spectra from 2 *Apo-Ident* customers from 2 batches from the substance/substance group *Bepanthen[®] Wund- und Heilsalbe*.

Supplier	Substance	Batch	Spectra
Bayer	Bepanthen [®] Wund- und Heilsalbe	GP01AUE	1
Bombastus	Bepanthen [®] Wund- und Heilsalbe	GP01-DR9	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*.

- 4210 spectra from 396 *Apo-Ident* customers from a total of 2109 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Bepanthen® Wund- und Heilsalbe* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Bepanthen® Wund- und Heilsalbe* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 558
Type B	0	100	0	23 248
Type C	0	2	0	4210

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9556 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9509 %)	100.0000 % (> 94.0000 %)
Type C	100.0000 % (> 98.5703 %)	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
31048	31048	0.00	32.40
31758	31758	0.00	35.91
33613	33613	0.00	36.03

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Bergamot oil**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 30307-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Bergamot oil; Oleum citrus bergamia

Special notes

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

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Bergamot oil*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Bombastus	Bergamot oil	290998	31641	40	not required
Bombastus	Bergamot oil	290998	31760	40	not required
Taoasis	Bergamot oil	3221028-121642	31784	40	not required

Validation samples

A total of 48 238 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 *Bergamot oil*. These samples are listed above in the [calibration samples](#) section.
- 20 558 spectra from a total of 484 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 140 spectra of 5 reference samples from the substance/substance group *Bergamot oil*.

Supplier	Substance	Batch	Sample ID	Spectra
Bombastus	Bergamot oil	290998	31641 [†]	20
Bombastus	Bergamot oil	290998	31760 [†]	20
Taoasis	Bergamot oil	3221028-121642	31784 [†]	20
Taoasis	Bergamot oil	1968-128263	33437	40
Primavera	Bergamot oil	00189A27	34387	40

- 23 208 spectra from a total of 574 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 15 spectra from 12 *Apo-Ident* customers from 14 batches from the substance/substance group *Bergamot oil*.

[†]These spectra were recorded from 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
Bombastus	Bergamot oil	264008	1
Kaders	Bergamot oil	130564	1
Taoasis	Bergamot oil	32338-109135	1
Caelo	Bergamot oil	12020702	1
Taoasis	Bergamot oil	B130301-110610	1
Noweda	Bergamot oil	271858	1
Taoasis	Bergamot oil	96243	1
Taoasis	Bergamot oil	33110-110701	1
Caelo	Bergamot oil	13141501	2
Taoasis	Bergamot oil	32579-111866	1
Taoasis	Bergamot oil	33697-112408	1
Bombastus	Bergamot oil	280260	1
Taoasis	Bergamot oil	d01be14m-121110bag90	1
Bombastus	Bergamot oil	53731-125890	1

- 4197 spectra from 395 *Apo-Ident* customers from a total of 2097 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Bergamot oil* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Bergamot oil* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 558
Type B	0	139	1	23 208
Type C	0	11	4	4197

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9556 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9508 %)	99.2857 % (> 97.1429 %)
Type C	100.0000 % (> 98.5392 %)	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
31641	31641	0.00	33.83
31760	31760	0.00	31.98
31784	31784	0.00	30.06

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Cajeput oil / Eucalyptus oil / Niaouli oil / Ros...**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 30966-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Cajeput oil / Eucalyptus oil / Niaouli oil / Rosemary oil; Cajeput (essential oil); Eucalyptus oil; Niaouli oil; Oleum Cajeputi artificiale; Oleum eucalypti; Oleum niaouli; Oleum rosmarini; Rosemary oil

Special notes

When selecting the *Cajeput oil / Eucalyptus oil / Niaouli oil / Rosemary oil* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Cajeput oil / Eucalyptus oil / Niaouli oil / Rosemary oil*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Taoasis	Eucalyptus oil	527885-109705A	30966	40	not required
Taoasis	Cajeput (essenti...	130829-112094BAG90451	31136	40	not required
Caelo	Niaouli oil	13099606	31420	40	AR-14-FG-012561-01

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Taoasis	Niaouli oil	34167-116962	31548	40	not required
Taoasis	Rosemary oil	3231031-117639	31551	40	not required
Taoasis	Rosemary oil	1921019-120666	31691	40	not required
Taoasis	Eucalyptus oil	7271001-121014	31694	40	not required
Taoasis	Cajeput (essenti...	1662-124326	32173	40	not required
Taoasis	Niaouli oil	40428-124242	32174	40	not required
Taoasis	Eucalyptus oil	043127A-125381	32903	40	not required
Taoasis	Rosemary oil	1862-126630	32933	40	not required
Taoasis	Niaouli oil	1500450-125771	32970	40	not required
Taoasis	Cajeput (essenti...	1724-127033	33657	40	not required
Taoasis	Rosemary oil	2150-2819	34104	40	not required
Primavera	Eucalyptus oil	00178A27	34374	40	not required
Primavera	Niaouli oil	00410K26	34380	40	not required
Primavera	Cajeput (essenti...	00012A27	34401	40	not required

Validation samples

A total of 48 238 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 680 spectra of 17 reference samples from the substance/substance group *Cajeput oil* / *Eucalyptus oil* / *Niaouli oil* / *Rosemary oil*. These samples are listed above in the [calibration samples](#) section.
- 19 998 spectra from a total of 469 batches from further 155 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 500 spectra of 15 reference samples from the substance/substance group *Cajeput oil* / *Eucalyptus oil* / *Niaouli oil* / *Rosemary oil*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Niaouli oil	13099606	31420 [†]	20
Taoasis	Niaouli oil	34167-116962	31548 [†]	20
Taoasis	Rosemary oil	3231031-117639	31551 [†]	20
Taoasis	Rosemary oil	1921019-120666	31691 [†]	20
Taoasis	Eucalyptus oil	7271001-121014	31694 [†]	20
Taoasis	Rosemary oil	1614-125089	32802	40
Taoasis	Niaouli oil	1500450-125771	32971	40
Taoasis	Cajeput (essential oil)	1724-127033	33022	40

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Supplier	Substance	Batch	Sample ID	Spectra
Taoasis	Cajeput (essential oil)	1724-127033	33023	40
Taoasis	Eucalyptus oil	41192-129138	33621	40
Primavera	Eucalyptus oil	00650K25	33808	40
Primavera	Eucalyptus oil	00256A26	33955	40
Taoasis	Niaouli oil	1500450-1985	34040	40
Taoasis	Cajeput (essential oil)	2216-2921	34114	40
Primavera	Eucalyptus oil	00710C26	34172	40

- 22 848 spectra from a total of 564 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 76 spectra from 37 *Apo-Ident* customers from 57 batches from the substance/substance group *Cajeput oil* / *Eucalyptus oil* / *Niaouli oil* / *Rosmary oil*.

Supplier	Substance	Batch	Spectra
PVL	Cajeput (essential oil)	150712	1
Taoasis	Cajeput (essential oil)	24077-106468	1
Aurica	Cajeput (essential oil)	11024710	1
Taoasis	Cajeput (essential oil)	L201323018-113057	1
Taoasis/Sanacorp	Cajeput (essential oil)	L201323018-113057	1
Taoasis	Cajeput (essential oil)	130829-113045	1
Taoasis	Cajeput (essential oil)	131010-115487	2
Taoasis	Cajeput (essential oil)	131010-117241	2
Taoasis	Cajeput (essential oil)	661027-117257	2
Taoasis	Cajeput (essential oil)	6781012-119058	1
Taoasis	Cajeput (essential oil)	661027-118368	1
Taoasis	Cajeput (essential oil)	1301-121889	1
Taoasis	Cajeput (essential oil)	1301-32758	1
Taoasis	Cajeput (essential oil)	1518-122790	1
Taoasis	Cajeput (essential oil)	1518-122691	1
Taoasis	Cajeput (essential oil)	1662-124870	1
Taoasis	Cajeput (essential oil)	1724-125910	1
Bombastus	Cajeput (essential oil)	18001011	1
Taoasis	Cajeput (essential oil)	131010-117257	1
TAOASIS GmbH D-32758 De...	Cajeput (essential oil)	1989-2818	1
Caelo	Eucalyptus oil	11324112	1
Taoasis	Eucalyptus oil	33364-110871	1
Caelo	Eucalyptus oil	13106407LOT	1
Taoasis	Eucalyptus oil	130205-111868	1
Taoasis	Eucalyptus oil	543495-112704	1
Taoasis	Eucalyptus oil	43703-122178	1
Taoasis	Eucalyptus oil	43703-122404	1
Caesar & Loretz GmbH Hi...	Eucalyptus oil	15063312	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
Bombastus	Eucalyptus oil	289701	1
Bombastus	Eucalyptus oil	297737	1
Caelo	Eucalyptus oil	300881	1
Euro OTC	Eucalyptus oil	1412030-01	1
Caelo	Eucalyptus oil	15400202	2
Taoasis	Eucalyptus oil	52046-124692	1
Caelo	Eucalyptus oil	15063309	1
Caesar & Loretz GmbH Hi...	Eucalyptus oil	15400203	1
Bombastus	Eucalyptus oil	303336	1
Bombastus	Eucalyptus oil	305628	1
Caelo	Eucalyptus oil	15400217	1
Caelo	Eucalyptus oil	16351301	1
Caelo	Eucalyptus oil	15400203	1
Caelo	Eucalyptus oil	14039603	1
Bombastus	Eucalyptus oil	305608	1
Caelo	Eucalyptus oil	16351312	1
Taoasis	Niaouli oil	22553-120413	1
Taoasis	Niaouli oil	22553-120482	1
Taoasis	Niaouli oil	22553-121510	1
Taoasis	Niaouli oil	40428-123092	1
Bauer	Niaouli oil	6558611608	1
Taoasis	Rosemary oil	1526-123355	1
Taoasis	Rosemary oil	26057-119164	1
Taoasis	Rosemary oil	26057-122996	1
Bombastus	Rosemary oil	301449	2
Caelo	Rosemary oil	15442017	2
Taoasis	Rosemary oil	1526-125088	1
Taoasis	Rosemary oil	1614-125089	12
Caelo	Rosemary oil	16276905	1
Caelo	Rosemary oil	16276903	1
Caelo	Rosemary oil	306506	1

- 4136 spectra from 394 *Apo-Ident* customers from a total of 2054 batches from a further 131 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	680	0	19 998
Type B	0	500	0	22 848
Type C	0	71	5	4136

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9552 %)	100.0000 % (> 99.1176 %)
Type B	100.0000 % (> 99.9507 %)	100.0000 % (> 98.8000 %)
Type C	100.0000 % (> 98.5354 %)	93.4211 % (> 89.4737 %)

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
32970	32970	0.00	46.45
30966	30966	0.00	38.26
34374	34374	0.00	34.04
31691	31691	0.00	16.90
31694	31694	0.00	35.65
32173	32173	0.00	70.05
33657	33657	0.00	69.81
32174	32174	0.00	40.51
31136	31136	0.00	57.72
34401	34401	0.00	62.42
31548	31548	0.00	51.51
34380	34380	0.00	46.23
31551	31551	0.00	21.43
31420	31420	0.00	29.15
34104	34104	0.00	23.56
32903	32903	0.00	28.52
32933	32933	0.00	29.31

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Camphor oil**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 33826-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Camphor oil

Special notes

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

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan 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 oil*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Taoasis	Camphor oil	74521-140	33826	40	not required
Taoasis	Camphor oil	944	33827	40	not required

Validation samples

A total of 48 238 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 *Camphor oil*. These samples are listed above in the [calibration samples](#) section.
- 20 598 spectra from a total of 484 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 40 spectra of 1 reference samples from the substance/substance group *Camphor oil*.

Supplier	Substance	Batch	Sample ID	Spectra
Taoasis	Camphor oil	78793-2563	34039	40

- 23 308 spectra from a total of 577 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 0 spectra from 0 *Apo-Ident* customers from 0 batches from the substance/substance group *Camphor oil*.
- 4212 spectra from 396 *Apo-Ident* customers from a total of 2111 batches from a further 135 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Camphor oil* can clearly be 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 oil* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 598
Type B	0	40	0	23 308
Type C	0	0	0	4212

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9558 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9513 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 98.5344 %)	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
33826	33826	0.00	32.54
33827	33827	0.00	31.99

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Carrot seed oil**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 31555-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Carrot seed oil; Oleum daucus carota

Special notes

When selecting the *Carrot seed oil* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Carrot seed oil*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Taoasis	Carrot seed oil	937-117443	31555	40	not required
Taoasis	Carrot seed oil	1775-125361BAG90451	32812	40	not required
Taoasis	Carrot seed oil	3496IN-K08	34282	40	not required

Validation samples

A total of 48 238 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 *Carrot seed oil*. These samples are listed above in the [calibration samples](#) section.
- 20 558 spectra from a total of 483 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 160 spectra of 4 reference samples from the substance/substance group *Carrot seed oil*.

Supplier	Substance	Batch	Sample ID	Spectra
Taoasis	Carrot seed oil	937-117443	31555 [†]	20
Taoasis	Carrot seed oil	26058-119083BAG90451	31636	60
Taoasis	Carrot seed oil	1775-125361BAG90451	33203	40
Taoasis	Carrot seed oil	2037	33995	40

- 23 188 spectra from a total of 574 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 0 spectra from 0 *Apo-Ident* customers from 0 batches from the substance/substance group *Carrot seed oil*.
- 4212 spectra from 396 *Apo-Ident* customers from a total of 2111 batches from a further 135 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented

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

within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Carrot seed oil* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Carrot seed oil* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 558
Type B	0	160	0	23 188
Type C	0	0	0	4212

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9556 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9508 %)	100.0000 % (> 96.2500 %)
Type C	100.0000 % (> 98.5344 %)	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
32812	32812	0.00	62.63
31555	31555	0.00	32.20
34282	34282	0.00	58.79

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Cedar wood oil**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 30654-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Cedar wood oil; Oleum cedrus deodara

Special notes

When selecting the *Cedar wood oil* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Cedar wood oil*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Taoasis	Cedar wood oil	7891018-121034	31777	40	not required
Apotheker Bau...	Cedar wood oil	2.880926.1507	31851	40	not required
Taoasis	Cedar wood oil	1627-125061	33199	40	not required

Validation samples

A total of 48 238 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 *Cedar wood oil*. These samples are listed above in the [calibration samples](#) section.
- 20 558 spectra from a total of 483 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 160 spectra of 5 reference samples from the substance/substance group *Cedar wood oil*.

Supplier	Substance	Batch	Sample ID	Spectra
Taoasis	Cedar wood oil	26473-83914BAG90451	30750	40
Taoasis	Cedar wood oil	7891018-121034	31777 [†]	20
Apotheker Bauer & Cie	Cedar wood oil	2.880926.1507	31851 [†]	20
Taoasis	Cedar wood oil	1627-124623	32268	40
Taoasis	Cedar wood oil	1802-1975	34102	40

- 23 188 spectra from a total of 573 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 14 spectra from 3 *Apo-Ident* customers from 11 batches from the substance/substance group *Cedar wood oil*.

[†]These spectra were recorded from 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
Taoasis/Phönix	Cedar wood oil	3292687	1
Taoasis	Cedar wood oil	32812-113008	3
Taoasis	Cedar wood oil	381008-116967	1
Taoasis	Cedar wood oil	7711023-120348	1
Taoasis	Cedar wood oil	7891019-121034	1
Taoasis	Cedar wood oil	7891018-120108	1
Taoasis	Cedar wood oil	831018-122540	1
Taoasis	Cedar wood oil	831018-123089	2
Taoasis	Cedar wood oil	831018-124172	1
Biofrid / Noweda	Cedar wood oil	17066	1
Taoasis	Cedar wood oil	1627-125061	1

- 4198 spectra from 396 *Apo-Ident* customers from a total of 2100 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Cedar wood oil* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Cedar wood oil* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 558
Type B	0	120	40	23 188
Type C	0	14	0	4198

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9556 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9508 %)	75.0000 % (> 73.1250 %)
Type C	100.0000 % (> 98.5396 %)	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
31777	31777	0.00	70.07
33199	33199	0.00	65.40
31851	31851	0.00	21.09

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Chamomile (essential oil)**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 33811-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Chamomile (essential oil)

Special notes

When selecting the *Chamomile (essential oil)* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Chamomile (essential oil)*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Primavera	Chamomile (essen...	00888G25	33811	40	not required
Taoasis	Chamomile (essen...	934	33825	30	not required
Taoasis	Chamomile (essen...	2132-1981	33952	40	not required
Primavera	Chamomile (essen...	00715L25	33963	40	not required

Validation samples

A total of 48 238 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 *Chamomile (essential oil)*. These samples are listed above in the [calibration samples](#) section.
- 20 528 spectra from a total of 482 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 90 spectra of 3 reference samples from the substance/substance group *Chamomile (essential oil)*.

Supplier	Substance	Batch	Sample ID	Spectra
Taoasis	Chamomile (essential oil)	100477-850	33824	40
Taoasis	Chamomile (essential oil)	934	33825 [†]	10
Primavera	Chamomile (essential oil)	00139C26	34167	40

- 23 258 spectra from a total of 575 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 0 spectra from 0 *Apo-Ident* customers from 0 batches from the substance/substance group *Chamomile (essential oil)*.

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

- 4212 spectra from 396 *Apo-Ident* customers from a total of 2111 batches from a further 135 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Chamomile (essential oil)* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Chamomile (essential oil)* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 528
Type B	0	66	24	23 258
Type C	0	0	0	4212

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9555 %)	100.0000 % (> 96.0000 %)
Type B	100.0000 % (> 99.9509 %)	73.3333 % (> 70.0000 %)
Type C	100.0000 % (> 98.5344 %)	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
33811	33811	0.00	49.87
33963	33963	0.00	50.67
33825	33825	0.00	23.75
33952	33952	0.00	25.51

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Cinnamon bark oil, Ceylon**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 30957-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Cinnamon bark oil, Ceylon; Oleum cinnamomi ceylanici

Special notes

When selecting the *Cinnamon bark oil, Ceylon* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Cinnamon bark oil, Ceylon*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Taoasis	Cinnamon bark oi...	121108-109782BAG90451	30957	40	not required
Taoasis	Cinnamon bark oi...	1311130547-119819	31648	40	not required
Taoasis	Cinnamon bark oi...	415-770	34107	40	not required
Primavera	Cinnamon bark oi...	00221A27	34375	40	not required

Validation samples

A total of 48 238 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 *Cinnamon bark oil, Ceylon*. These samples are listed above in the [calibration samples](#) section.
- 20 518 spectra from a total of 482 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 100 spectra of 3 reference samples from the substance/substance group *Cinnamon bark oil, Ceylon*.

Supplier	Substance	Batch	Sample ID	Spectra
Taoasis	Cinnamon bark oil, Ceylon	1311130547-119819	31648 [†]	20
Taoasis	Cinnamon bark oil, Ceylon	415-126411	32791	40
Taoasis	Cinnamon bark oil, Ceylon	415-126411	33202	40

- 23 248 spectra from a total of 576 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 0 spectra from 0 *Apo-Ident* customers from 0 batches from the substance/substance group *Cinnamon bark oil, Ceylon*.

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

- 4212 spectra from 396 *Apo-Ident* customers from a total of 2111 batches from a further 135 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Cinnamon bark oil, Ceylon* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Cinnamon bark oil, Ceylon* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 518
Type B	0	100	0	23 248
Type C	0	0	0	4212

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9555 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9509 %)	100.0000 % (> 94.0000 %)
Type C	100.0000 % (> 98.5344 %)	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
34375	34375	0.00	104.26
30957	30957	0.00	228.83
31648	31648	0.00	189.68
34107	34107	0.00	191.55

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Citric oil**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 31558-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Citric oil; Oleum citri

Special notes

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

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan 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 oil*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Taoasis	Citric oil	D04LI14M-117513	31558	40	not required
Taoasis	Citric oil	3681027-122724	31838	40	not required
Taoasis	Citric oil	127939-ITJ04	33611	40	not required

Validation samples

A total of 48 238 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 *Citric oil*. These samples are listed above in the [calibration samples](#) section.
- 20 558 spectra from a total of 483 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 160 spectra of 5 reference samples from the substance/substance group *Citric oil*.

Supplier	Substance	Batch	Sample ID	Spectra
Taoasis	Citric oil	D04LI14M-117513	31558 [†]	20
Taoasis	Citric oil	3681027-122724	31838 [†]	20
Taoasis	Citric oil	03LI16M-125453I09	32771	40
Taoasis	Citric oil	03LI16M-125453I09	32941	40
Primavera	Citric oil	00011A27	34379	40

- 23 188 spectra from a total of 574 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 31 spectra from 29 *Apo-Ident* customers from 24 batches from the substance/substance group *Citric oil*.

[†]These spectra were recorded from 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	Citric oil	14365212	2
Fagron	Citric oil	14H06-B02-308273	1
Sanacorp	Citric oil	15182703	1
Caelo	Citric oil	15182703	2
Bombastus	Citric oil	301912	1
Fagron	Citric oil	15F29-B04	1
Fagron	Citric oil	13K14-B03-294704	1
Taoasis	Citric oil	3681003-124333	1
Caelo	Citric oil	14385201	1
Fagron	Citric oil	15F29-B04-322985	1
Caelo	Citric oil	16028702	3
Caelo	Citric oil	W373	1
Fagron	Citric oil	14H06-B02-299949	1
Bombastus	Citric oil	15F29-B04-325354	1
Fagron	Citric oil	15F29-804	1
Caelo	Citric oil	16028719	2
Fagron	Citric oil	15f29-b04-325354	1
Bombastus	Citric oil	304030	1
Caelo	Citric oil	16275202	1
Caelo	Citric oil	16275216	2
Fagron	Citric oil	17B14-B04-334835	1
Bergland	Citric oil	K603901	1
Caelo	Citric oil	18092202	1
Fagron	Citric oil	17B14B04341736	1
Bombastus	Citric oil	12268005-1-0	1

- 4181 spectra from 392 *Apo-Ident* customers from a total of 2087 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance 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 oil* can clearly be 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 oil* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 558
Type B	0	160	0	23 188
Type C	0	31	0	4181

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9556 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9508 %)	100.0000 % (> 96.2500 %)
Type C	100.0000 % (> 98.5368 %)	100.0000 % (> 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
33611	33611	0.00	17.24
31558	31558	0.00	18.12
31838	31838	0.00	17.44

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Citronella oil**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 31550-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Citronella oil; Oleum cymbopogon winterianus

Special notes

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

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Citronella oil*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Taoasis	Citronella oil	140121-115623	31550	40	not required
Taoasis	Citronella oil	1291021-122850	31840	40	not required
Taoasis	Citronella oil	1794-373	33728	40	not required
Primavera	Citronella oil	00671A27	34409	40	not required

Validation samples

A total of 48 238 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 *Citronella oil*. These samples are listed above in the [calibration samples](#) section.
- 20 518 spectra from a total of 482 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

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

Supplier	Substance	Batch	Sample ID	Spectra
Taoasis	Citronella oil	140121-115623	31550 [†]	20
Taoasis	Citronella oil	1291021-122850	31840 [†]	20
Taoasis	Citronella oil	108494-126305	32798	40
Taoasis	Citronella oil	108494-126776	33047	40

- 23 228 spectra from a total of 574 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 2 spectra from 2 *Apo-Ident* customers from 2 batches from the substance/substance group *Citronella oil*.

[†]These spectra were recorded from 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
Taoasis	Citronella oil	5211028-120284	1
Apotheker Bauer und Cie...	Citronella oil	7444171705	1

- 4210 spectra from 396 *Apo-Ident* customers from a total of 2109 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Citronella oil* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Citronella oil* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 518
Type B	0	120	0	23 228
Type C	0	2	0	4210

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9555 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9508 %)	100.0000 % (> 95.0000 %)
Type C	100.0000 % (> 98.5703 %)	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
34409	34409	0.00	38.22
31550	31550	0.00	37.97
31840	31840	0.00	42.30
33728	33728	0.00	37.71

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group	Citrus oil / Lavender oil / Clary sage oil / Myrt...
Substance class	APIs & excipients, liquid/semi-solid (other)
Report date	24/05/2019
Report number	30961-2019-05-24
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Citrus oil / Lavender oil / Clary sage oil / Myrtle oil / Petitgrain oil / Hyssop oil; Citrus oil; Clary sage oil; Hyssop oil; Lavender oil; Myrtle oil; Oleum citrus aurantium; Oleum hyssopus officinalis; Oleum lavendula officinalis; Oleum salviae sclarea; Petitgrain oil

Special notes

When selecting the *Citrus oil / Lavender oil / Clary sage oil / Myrtle oil / Petitgrain oil / Hyssop oil* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-6679-5	<i>European Pharmacopoeia 9th Edition, Basic Version 2017</i> [3]
Komm2.2.40	<i>Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident</i> [4]
AA004	<i>Erstellung und Validierung eines IdentModul-Updates</i>
Appendix F	Addition to the second-stage models

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Citrus oil / Lavender oil / Clary sage oil / Myrtle oil / Petitgrain oil / Hyssop oil*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Taoasis	Lavender oil	L16812DN-108661BAG90451	30961	40	not required
Taoasis	Lavender oil	110186BAG90451	30962	40	not required

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Taoasis	Hyssop oil	31823-118643	31649	40	not required
Taoasis	Clary sage oil	2098-115222	31669	40	not required
Taoasis	Lavender oil	22015-121843	31756	40	not required
Taoasis	Petitgrain oil	26056-120864	31778	40	not required
Taoasis	Hyssop oil	33065-122200	31782	40	not required
Apotheker Bau...	Hyssop oil	13.201345120.16.02	31850	40	not required
Apotheker Bau...	Petitgrain oil	6.56267.16.02	31852	40	not required
Taoasis	Hyssop oil	1616260-125049	32980	40	not required
Taoasis	Petitgrain oil	4031015-126048	33024	40	not required
Taoasis	Clary sage oil	1834-127059	33033	40	not required
Primavera	Citrus oil	00438D25	33760	40	not required
Primavera	Myrtle oil	00401D25	33797	40	not required
Primavera	Lavender oil	00684K25	33804	40	not required
Taoasis	Citrus oil	788	33816	40	not required
Taoasis	Myrtle oil	013	33830	40	not required
Primavera	Myrtle oil	00877L25	33957	40	not required
Primavera	Citrus oil	00621G26	34294	40	not required
Primavera	Clary sage oil	00529M26	34367	40	not required
Primavera	Citrus oil	00673L26	34395	40	not required

Validation samples

A total of 48 238 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 840 spectra of 21 reference samples from the substance/substance group *Citrus oil / Lavender oil / Clary sage oil / Myrtle oil / Petitgrain oil / Hyssop oil*. These samples are listed above in the [calibration samples](#) section.
- 19 838 spectra from a total of 465 batches from further 153 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 860 spectra of 25 reference samples from the substance/substance group *Citrus oil / Lavender oil / Clary sage oil / Myrtle oil / Petitgrain oil / Hyssop oil*.

Supplier	Substance	Batch	Sample ID	Spectra
Taoasis	Clary sage oil	487962-107805BAG90451	30749	40
Taoasis	Petitgrain oil	29551-105402BAG90451	30752	40
Taoasis	Hyssop oil	31823-118643	31649 [†]	20

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Supplier	Substance	Batch	Sample ID	Spectra
Taoasis	Clary sage oil	2098-115222	31669 [†]	20
Taoasis	Lavender oil	22015-121843	31756 [†]	20
Taoasis	Petitgrain oil	26056-120864	31778 [†]	20
Taoasis	Hyssop oil	33065-122200	31782 [†]	20
Apotheker Bauer & Cie	Hyssop oil	13.201345120.16.02	31850 [†]	20
Apotheker Bauer & Cie	Petitgrain oil	6.56267.16.02	31852 [†]	20
Taoasis	Clary sage oil	2098-115222	32797	40
Apotheker Bauer & Cie	Hyssop oil	13.201604082.17.01	32923	40
Taoasis	Lavender oil	2/2015-125808I09	33015	40
Taoasis	Lavender oil	22015-125925I10	33016	40
Taoasis	Petitgrain oil	4031015-126048	33025	40
Primavera	Myrtle oil	00971J25	33807	40
Taoasis	Citrus oil	1510-135	33817	40
Taoasis	Clary sage oil	10140-145	33871	40
Taoasis	Clary sage oil	10140-145	33943	40
Primavera	Lavender oil	00793A26	33953	40
Taoasis	Petitgrain oil	4031015-147	34108	40
Taoasis	Hyssop oil	1616260-1982	34110	40
Primavera	Lavender oil	00184G26	34165	40
Primavera	Citrus oil	00348C26	34178	40
Taoasis	Clary sage oil	1834-129098	34284	40
Primavera	Myrtle oil	00392M26	34384	40

- 22 488 spectra from a total of 555 batches from further 198 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 35 spectra from 19 *Apo-Ident* customers from 20 batches from the substance/substance group *Citrus oil / Lavender oil / Clary sage oil / Myrtle oil / Petitgrain oil / Hyssop oil*.

Supplier	Substance	Batch	Spectra
Taoasis	Hyssop oil	31095-105392	1
Taoasis	Clary sage oil	487962-106655	1
Taoasis	Clary sage oil	2098-115222	1
Taoasis	Clary sage oil	2098-119159	1
Bergland	Lavender oil	K502790	1
Cielo	Lavender oil	15278105	1
Taoasis	Lavender oil	4651010	1
Taoasis	Lavender oil	22015-125927	1
Taoasis	Lavender oil	34/151/16	1
Bombastus	Lavender oil	300666	1
Taoasis	Lavender oil	2/2015-125808I09	12
Cordes/Noweda	Lavender oil	16023002	1
Taoasis/Noweda	Lavender oil	16716-126380/11	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
Bombastus	Lavender oil	303303	1
Bombastus	Lavender oil	305279	1
Caelo	Lavender oil	16292216	1
Caelo	Lavender oil	17132711	4
Fagron	Lavender oil	17G20-B07-342691	1
Primavera/Phoenix	Lavender oil	326C26	1
Caelo	Lavender oil	1010548	2

- 4177 spectra from 392 *Apo-Ident* customers from a total of 2091 batches from a further 132 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	840	0	19 838
Type B	0	850	10	22 486
Type C	0	35	0	4177

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9552 %)	100.0000 % (> 99.2857 %)
Type B	100.0000 % (> 99.9514 %)	98.8372 % (> 98.4884 %)
Type C	100.0000 % (> 98.5365 %)	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
33797	33797	0.00	33.42
34367	34367	0.00	93.67
33957	33957	0.00	34.79
32980	32980	0.00	18.79
33804	33804	0.00	74.40
31778	31778	0.00	81.40
33024	33024	0.00	69.82
33830	33830	0.00	43.28
31782	31782	0.00	40.63
31649	31649	0.00	41.80
33760	33760	0.00	40.04
33816	33816	0.00	32.38
34294	34294	0.00	33.18
34395	34395	0.00	32.09
31669	31669	0.00	57.92
33033	33033	0.00	59.94
30961	30961	0.00	53.25
31850	31850	0.00	38.07
30962	30962	0.00	68.80
31756	31756	0.00	75.23
31852	31852	0.00	34.02

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Clove oil**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 31270-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Clove oil; Oleum caryophylli

Special notes

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

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Clove oil*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Bombastus	Clove oil	279132	31035	40	not required
Caelo	Clove oil	12380605	31270	38	not required
Taoasis	Clove oil	2891012-116936	31557	40	not required
Taoasis	Clove oil	1426-120481	31683	40	not required

Validation samples

A total of 48 238 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 158 spectra of 4 reference samples from the substance/substance group *Clove oil*. These samples are listed above in the [calibration samples](#) section.
- 20 520 spectra from a total of 482 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 122 spectra of 5 reference samples from the substance/substance group *Clove oil*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Clove oil	12380605	31270 [†]	2
Taoasis	Clove oil	2891012-116936	31557 [†]	20
Taoasis	Clove oil	1426-120481	31683 [†]	20
Taoasis	Clove oil	1598-124689	32938	40
Taoasis	Clove oil	1598-124689	32940	40

- 23 226 spectra from a total of 574 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 6 spectra from 6 *Apo-Ident* customers from 6 batches from the substance/substance group *Clove oil*.

[†]These spectra were recorded from 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	Clove oil	15119304	1
Caelo	Clove oil	15316102	1
Primavera	Clove oil	47G24	1
Caelo	Clove oil	15316103	1
Caelo	Clove oil	15402108	1
Caelo	Clove oil	17354205	1

- 4206 spectra from 396 *Apo-Ident* customers from a total of 2105 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	158	0	20 520
Type B	0	122	0	23 226
Type C	0	5	1	4206

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9555 %)	100.0000 % (> 96.2025 %)
Type B	100.0000 % (> 99.9508 %)	100.0000 % (> 95.0820 %)
Type C	100.0000 % (> 98.5464 %)	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
31270	31270	0.00	458.17
31035	31035	0.00	460.33
31557	31557	0.00	436.26
31683	31683	0.00	444.07

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Common wormwood oil**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 30842-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Common wormwood oil; Oleum artemisia vulgaris

Special notes

When selecting the *Common wormwood oil* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Common wormwood oil*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
ASAV Apotheke...	Common wormwood ...	10116310555	31637	40	not required
ASAV Apotheke...	Common wormwood ...	10409310558	34209	40	not required

Validation samples

A total of 48 238 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 *Common wormwood oil*. These samples are listed above in the [calibration samples](#) section.
- 20 598 spectra from a total of 484 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 220 spectra of 6 reference samples from the substance/substance group *Common wormwood oil*.

Supplier	Substance	Batch	Sample ID	Spectra
Taoasis	Common wormwood oil	7.9363	30842	40
ASAV Apotheken-Service	Common wormwood oil	10116310555	31637 [†]	20
ASAV Apotheken-Service	Common wormwood oil	10815310556	32770	40
Apotheker Bauer & Cie	Common wormwood oil	10815310556	33013	40
ASAV Apotheken-Service	Common wormwood oil	10815310556	33600	40
ASAV Apotheken-Service	Common wormwood oil	10815310556	33851	40

- 23 128 spectra from a total of 575 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 1 spectra from 1 *Apo-Ident* customers from 1 batches from the substance/substance group *Common wormwood oil*.

[†]These spectra were recorded from 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	Common wormwood oil	79363	1

- 4211 spectra from 396 *Apo-Ident* customers from a total of 2110 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Common wormwood oil* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Common wormwood oil* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 598
Type B	0	78	142	23 128
Type C	0	0	1	4211

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9558 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9507 %)	35.4545 % (> 34.0909 %)
Type C	100.0000 % (> 98.6061 %)	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
31637	31637	0.00	69.08
34209	34209	0.00	76.43

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Contramarum aroma**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 31007-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Contramarum aroma; Contramarum flavour

Special notes

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

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Contramarum aroma*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Contramarum aroma	13141605	31007	40	1403096
Caelo	Contramarum aroma	13411002	31289	40	not required
Caelo	Contramarum aroma	13411007	31398	40	not required

Validation samples

A total of 48 238 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 *Contramarum aroma*. These samples are listed above in the [calibration samples](#) section.
- 20 558 spectra from a total of 483 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 120 spectra of 3 reference samples from the substance/substance group *Contramarum aroma*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Contramarum aroma	162671	32695	40
Caelo	Contramarum aroma	172230	33701	40
Caelo	Contramarum aroma	181067	34066	40

- 23 228 spectra from a total of 575 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 77 spectra from 36 *Apo-Ident* customers from 43 batches from the substance/substance group *Contramarum aroma*.

Supplier	Substance	Batch	Spectra
Caelo	Contramarum aroma	11378804	1
Fiebig	Contramarum aroma	11378810	1
Caelo	Contramarum aroma	7071207	1
Gehe	Contramarum aroma	12201404	1
Caelo	Contramarum aroma	12201407	2

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Supplier	Substance	Batch	Spectra
Caelo	Contramarum aroma	13141606	3
Cael	Contramarum aroma	13141603	1
Caelo	Contramarum aroma	7091302	1
Caelo	Contramarum aroma	13141608	2
Caelo	Contramarum aroma	13411007	4
Caelo	Contramarum aroma	13411011	1
Caelo	Contramarum aroma	134111002	1
Phoenix Goettin	Contramarum aroma	70401432001	1
VDL;02.01.15;6,42EUR	Contramarum aroma	14320001	1
Caelo	Contramarum aroma	14320006	3
Caelo	Contramarum aroma	21051508	1
Caelo	Contramarum aroma	2041515	1
Caelo	Contramarum aroma	14320009	1
Caelo	Contramarum aroma	14320001	1
VDL; 18.07.15; 6,56EUR	Contramarum aroma	14320005	1
Caelo	Contramarum aroma	14320015	3
Caelo	Contramarum aroma	143200009	1
Caelo	Contramarum aroma	14320005	1
Caelo	Contramarum aroma	15113003	2
Caelo	Contramarum aroma	15113002	2
Caelo	Contramarum aroma	1315Q-03148	1
Caelo	Contramarum aroma	15113011	1
Caelo	Contramarum aroma	16083801	6
Caelo	Contramarum aroma	16083802	2
Fagron	Contramarum aroma	16083801	1
Caelo	Contramarum aroma	16083804	2
Caelo	Contramarum aroma	5315A-03148	1
Caelo	Contramarum aroma	16083806	1
Caelo	Contramarum aroma	16267102	3
Caelo	Contramarum aroma	16083805	1
Caelo	Contramarum aroma	16267101	2
Caelo	Contramarum aroma	169267103	1
Caelo	Contramarum aroma	16267103	3
Caelo	Contramarum aroma	17223002	4
Caelo	Contramarum aroma	17223001	2
Caelo	Contramarum aroma	19121701	1
Caelo	Contramarum aroma	17223005	2
Caelo	Contramarum aroma	17223004	2
Caelo	Contramarum aroma	12051808	1
Caelo	Contramarum aroma	17223007	1
Caelo	Contramarum aroma	30081804	1

- 4135 spectra from 393 *Apo-Ident* customers from a total of 2068 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Contramarum aroma* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Contramarum aroma* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 558
Type B	0	117	3	23 228
Type C	0	60	17	4135

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9556 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9508 %)	97.5000 % (> 95.0000 %)
Type C	100.0000 % (> 98.5354 %)	77.9221 % (> 74.0260 %)

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

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

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

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
31007	31007	0.00	59.16
31289	31289	0.00	55.30
31398	31398	0.00	58.00

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Cumin oil**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 30449-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Cumin oil; Oleum cuminum cyminum

Special notes

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

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Cumin oil*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Taoasis	Cumin oil	130910-113031BAG90451	31141	40	not required
Taoasis	Cumin oil	51764-124375	32267	40	not required
Taoasis	Cumin oil	51764-124375	32904	40	not required

Validation samples

A total of 48 238 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 *Cumin oil*. These samples are listed above in the [calibration samples](#) section.
- 20 558 spectra from a total of 484 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 120 spectra of 3 reference samples from the substance/substance group *Cumin oil*.

Supplier	Substance	Batch	Sample ID	Spectra
Taoasis	Cumin oil	51764-124375	32266	40
Taoasis	Cumin oil	2016109952-127656	33841	40
Taoasis	Cumin oil	2016109952-128855	33873	40

- 23 228 spectra from a total of 575 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 2 spectra from 2 *Apo-Ident* customers from 2 batches from the substance/substance group *Cumin oil*.

Supplier	Substance	Batch	Spectra
Taoasis	Cumin oil	24081-106027	1
Taoasis	Cumin oil	121217-111221	1

- 4210 spectra from 396 *Apo-Ident* customers from a total of 2109 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Cumin oil* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Cumin oil* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 558
Type B	0	120	0	23 228
Type C	0	1	1	4210

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9556 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9508 %)	100.0000 % (> 95.0000 %)
Type C	100.0000 % (> 98.5703 %)	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
31141	31141	0.00	156.29
32267	32267	0.00	154.01
32904	32904	0.00	158.87

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Cypress oil**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 30457-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Cypress oil; Oleum cupressus sempervirens

Special notes

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

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Cypress oil*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Taoasis	Cypress oil	732-119820	31656	40	not required
Taoasis	Cypress oil	43953-129229	33623	40	not required
Primavera	Cypress oil	00177G25	33802	40	not required
Primavera	Cypress oil	00403L25	33954	40	not required

Validation samples

A total of 48 238 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 *Cypress oil*. These samples are listed above in the [calibration samples](#) section.
- 20 518 spectra from a total of 482 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 180 spectra of 5 reference samples from the substance/substance group *Cypress oil*.

Supplier	Substance	Batch	Sample ID	Spectra
Taoasis	Cypress oil	732-119820	31656 [†]	20
Taoasis	Cypress oil	107527-125443	32806	40
Taoasis	Cypress oil	107527-125443	33045	40
Primavera	Cypress oil	00586C26	34169	40
Primavera	Cypress oil	00660L26	34394	40

- 23 168 spectra from a total of 574 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 13 spectra from 2 *Apo-Ident* customers from 10 batches from the substance/substance group *Cypress oil*.

[†]These spectra were recorded from 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
Taoasis	Cypress oil	487749-107790	1
Taoasis	Cypress oil	487749-108547	1
Taoasis	Cypress oil	514085-111139	1
Taoasis	Cypress oil	33720-115882	1
Taoasis	Cypress oil	33720-118623	1
Taoasis	Cypress oil	33720-118895	2
Taoasis	Cypress oil	1039-121894	3
Taoasis	Cypress oil	1039-122434	1
Taoasis	Cypress oil	341012-123298	1
Taoasis	Cypress oil	107527-125443	1

- 4199 spectra from 396 *Apo-Ident* customers from a total of 2101 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Cypress oil* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Cypress oil* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 518
Type B	0	166	14	23 168
Type C	0	12	1	4199

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9555 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9508 %)	92.2222 % (> 90.5556 %)
Type C	100.0000 % (> 98.5400 %)	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
33802	33802	0.00	48.70
33954	33954	0.00	49.08
31656	31656	0.00	75.10
33623	33623	0.00	72.37

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Dermatop[®] base ointment**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 31060-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Dermatop[®] base ointment

Special notes

When selecting the *Dermatop[®] base ointment* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Dermatop[®] base ointment*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Sanofi aventis	Dermatop [®] base o...	3F052A	31060	40	not required
Sanofi aventis	Dermatop [®] base o...	5F080A	31717	40	not required

Validation samples

A total of 48 238 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 *Dermatop[®] base ointment*. These samples are listed above in the [calibration samples](#) section.
- 20 598 spectra from a total of 484 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 100 spectra of 3 reference samples from the substance/substance group *Dermatop[®] base ointment*.

Supplier	Substance	Batch	Sample ID	Spectra
Sanofi aventis	Dermatop [®] base ointment	5F080A	31717 [†]	20
Sanofi aventis	Dermatop [®] base ointment	5F089A	32718	40
Sanofi aventis	Dermatop [®] base ointment	7F106A	33965	40

- 23 248 spectra from a total of 575 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 8 spectra from 7 *Apo-Ident* customers from 6 batches from the substance/substance group *Dermatop[®] base ointment*.

Supplier	Substance	Batch	Spectra
Sanofi/Gehe	Dermatop [®] base ointment	5F078A	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	Dermatop [®] base ointment	5F080A	1
Sanacorp/Sanofi WE:22.0...	Dermatop [®] base ointment	5F086A	1
Sanofi - Noweda	Dermatop [®] base ointment	5F089A	1
Sanofi / Alliance Healt...	Dermatop [®] base ointment	6F094A	1
Sanofi/Kehr	Dermatop [®] base ointment	6F094A	1
Sanofi/Kehr	Dermatop [®] base ointment	6F099A	1
Sanofi / Gehe	Dermatop [®] base ointment	6F099A	1

- 4204 spectra from 396 *Apo-Ident* customers from a total of 2105 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Dermatop[®] base ointment* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Dermatop[®] base ointment* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 598
Type B	0	100	0	23 248
Type C	0	8	0	4204

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9558 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9509 %)	100.0000 % (> 94.0000 %)
Type C	100.0000 % (> 98.5434 %)	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
31060	31060	0.00	22.86
31717	31717	0.00	24.93

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Dexeryl®**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 31512-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Dexeryl®

Special notes

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

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Dexeryl®*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Pierre Fabre	Dexeryl®	G99016	31512	40	not required
Pierre Fabre	Dexeryl®	G00419	31630	40	not required
Pierre Fabre	Dexeryl®	G00650	33635	40	not required

Validation samples

A total of 48 238 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 *Dexeryl*[®]. These samples are listed above in the [calibration samples](#) section.
- 20 558 spectra from a total of 483 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 120 spectra of 4 reference samples from the substance/substance group *Dexeryl*[®].

Supplier	Substance	Batch	Sample ID	Spectra
Pierre Fabre	<i>Dexeryl</i> [®]	G99016	31512 [†]	20
Pierre Fabre	<i>Dexeryl</i> [®]	G00419	31630 [†]	20
Pierre Fabre	<i>Dexeryl</i> [®]	G00623	32762	40
Pierre Fabre	<i>Dexeryl</i> [®]	G00658	33945	40

- 23 228 spectra from a total of 574 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 4 spectra from 3 *Apo-Ident* customers from 4 batches from the substance/substance group *Dexeryl*[®].

Supplier	Substance	Batch	Spectra
PiereFabre/Now	<i>Dexeryl</i> [®]	G00577	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*.

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Supplier	Substance	Batch	Spectra
Pierre Fabre /Noweda	Dexeryl [®]	G00606	1
Pierre Fabre / phoenix	Dexeryl [®]	600869	1
Noweda	Dexeryl [®]	G00909	1

- 4208 spectra from 395 *Apo-Ident* customers from a total of 2107 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Dexeryl*[®] can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Dexeryl*[®] and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 558
Type B	0	120	0	23 228
Type C	0	4	0	4208

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9556 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9508 %)	100.0000 % (> 95.0000 %)
Type C	100.0000 % (> 98.5524 %)	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
31512	31512	0.00	20.84
31630	31630	0.00	28.74
33635	33635	0.00	24.11

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Dichloroacetic acid**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 30417-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Dichloroacetic acid; Acidum dichloroaceticum

Special notes

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

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Merck KGaA	Dichloroacetic a...	S6674841451	31642	40	not required
Merck KGaA	Dichloroacetic a...	S6674841614	32750	40	not required
Merck KGaA	Dichloroacetic a...	S7209041737	33794	40	not required

Validation samples

A total of 48 238 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 *Dichloroacetic acid*. These samples are listed above in the [calibration samples](#) section.
- 20 558 spectra from a total of 483 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 60 spectra of 2 reference samples from the substance/substance group *Dichloroacetic acid*.

Supplier	Substance	Batch	Sample ID	Spectra
Merck	Dichloroacetic acid	S6674841451	31642 [†]	20
Merck	Dichloroacetic acid	S7209241824	34185	40

- 23 288 spectra from a total of 576 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 0 spectra from 0 *Apo-Ident* customers from 0 batches from the substance/substance group *Dichloroacetic acid*.
- 4212 spectra from 396 *Apo-Ident* customers from a total of 2111 batches from a further 135 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 *Dichloroacetic 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 *Dichloroacetic 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	20 558
Type B	0	28	32	23 288
Type C	0	0	0	4212

The substance/substance group *Dichloroacetic 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 % (> 99.9556 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9511 %)	46.6667 % (> 41.6667 %)
Type C	100.0000 % (> 98.5344 %)	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
31642	31642	0.00	194.76
32750	32750	0.00	194.54
33794	33794	0.00	212.39

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Dimeticone ointment 10% SR / Optiderm® lotion**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 31243-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Dimeticone ointment 10% SR / Optiderm® lotion; Dimeticone ointment 10% SR; Optiderm® lotion;
Unguentum dimeticoni 10% SR

Special notes

When selecting the *Dimeticone ointment 10% SR / Optiderm® lotion* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Dimeticone ointment 10% SR / Optiderm® lotion*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
apomix	Dimeticone ointm...	08B041213	31243	30	not required
Almirall	Optiderm® lotion	341431	31266	40	not required
apomix	Dimeticone ointm...	10A181214	31638	40	not required
Almirall	Optiderm® lotion	511951	31759	40	not required
apomix	Dimeticone ointm...	11A271216	33041	40	not required
Almirall	Optiderm® lotion	706961	33268	40	not required

Validation samples

A total of 48 238 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 *Dimeticone ointment 10% SR / Optiderm[®] lotion*. These samples are listed above in the [calibration samples](#) section.
- 20 448 spectra from a total of 480 batches from further 157 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 140 spectra of 5 reference samples from the substance/substance group *Dimeticone ointment 10% SR / Optiderm[®] lotion*.

Supplier	Substance	Batch	Sample ID	Spectra
apomix	Dimeticone ointment 10% SR	10A181214	31638 [†]	20
Almirall	Optiderm [®] lotion	511951	31759 [†]	20
Almirall	Optiderm [®] lotion	633771	32757	20
Almirall	Optiderm [®] lotion	706961	33267	40
apomix	Dimeticone ointment 10% SR	10A021117	33870	40

- 23 208 spectra from a total of 573 batches from further 202 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 15 spectra from 4 *Apo-Ident* customers from 15 batches from the substance/substance group *Dimeticone ointment 10% SR / Optiderm[®] lotion*.

[†]These spectra were recorded from 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
Apomix/Phönix	Dimeticone ointment 10% SR	8A041213	1
Apomix	Dimeticone ointment 10% SR	3B180214	1
apomix/Holdermann	Dimeticone ointment 10% SR	4A080414	1
apomix/Gehe	Dimeticone ointment 10% SR	6A190614	1
apomix/Gehe	Dimeticone ointment 10% SR	10A181214	1
apomix/Holdermann	Dimeticone ointment 10% SR	1A150115	1
apomix/Phönix	Dimeticone ointment 10% SR	4A010415	1
apomix/Holdermann	Dimeticone ointment 10% SR	8A090915	1
apomix/Holdermann	Dimeticone ointment 10% SR	1A120116	1
apomix/Phönix	Dimeticone ointment 10% SR	5A020616	1
apomix/Holdermann	Dimeticone ointment 10% SR	6A300616	1
apomix/Phönix	Dimeticone ointment 10% SR	7A170816	1
Apomix	Dimeticone ointment 10% SR	2B150317	1
apomix/Phönix	Dimeticone ointment 10% SR	1A070217	1
Apomix	Dimeticone ointment 10% SR	11B031117	1

- 4197 spectra from 395 *Apo-Ident* customers from a total of 2096 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Dimeticone ointment 10% SR / Optiderm® lotion* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Dimeticone ointment 10% SR / Optiderm® lotion* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 448
Type B	0	140	0	23 208
Type C	0	15	0	4197

The substance/substance group *Dimeticone ointment 10% SR / Optiderm® lotion* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9553 %)	100.0000 % (> 97.3913 %)
Type B	100.0000 % (> 99.9508 %)	100.0000 % (> 95.7143 %)
Type C	100.0000 % (> 98.5392 %)	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
31243	31243	0.00	20.31
31638	31638	0.00	21.38
33041	33041	0.00	18.55
31266	31266	0.00	17.40
31759	31759	0.00	10.47
33268	33268	0.00	13.58

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Dwarf pine oil**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 31542-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Dwarf pine oil; Oleum pini pumilionis

Special notes

When selecting the *Dwarf pine oil* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Dwarf pine oil*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Taoasis	Dwarf pine oil	586-116867	31542	40	not required
Taoasis	Dwarf pine oil	25599-120877	31689	40	not required
Taoasis	Dwarf pine oil	8783-127273	32937	40	not required
Taoasis	Dwarf pine oil	11148-1980	34109	40	not required

Validation samples

A total of 48 238 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 *Dwarf pine oil*. These samples are listed above in the [calibration samples](#) section.
- 20 518 spectra from a total of 482 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 160 spectra of 5 reference samples from the substance/substance group *Dwarf pine oil*.

Supplier	Substance	Batch	Sample ID	Spectra
Taoasis	Dwarf pine oil	586-116867	31542 [†]	20
Taoasis	Dwarf pine oil	25599-120877	31689 [†]	20
Taoasis	Dwarf pine oil	8783-125163	32811	40
Taoasis	Dwarf pine oil	13260-3453	34290	40
Primavera	Dwarf pine oil	00386M26	34377	40

- 23 188 spectra from a total of 573 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 8 spectra from 3 *Apo-Ident* customers from 4 batches from the substance/substance group *Dwarf pine oil*.

[†]These spectra were recorded from 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
Taoasis	Dwarf pine oil	8238-126318	1
Taoasis	Dwarf pine oil	6635-122703	1
Taoasis	Dwarf pine oil	8238-124968	1
Taoasis	Dwarf pine oil	8783-125163	5

- 4204 spectra from 396 *Apo-Ident* customers from a total of 2107 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Dwarf pine oil* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Dwarf pine oil* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 518
Type B	0	145	15	23 188
Type C	0	5	3	4204

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9555 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9508 %)	90.6250 % (> 88.7500 %)
Type C	100.0000 % (> 98.5434 %)	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
31542	31542	0.00	33.26

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Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
31689	31689	0.00	33.84
32937	32937	0.00	40.52
34109	34109	0.00	34.84

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Ethanol 70% pure / denatured**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 30779-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Ethanol 70% pure / denatured; Ethanolum 70% rein / vergällt

Special notes

When selecting the *Ethanol 70% pure / denatured* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Ethanol 70% pure / denatured*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Hofmann's	Ethanol 70% pure...	271012	30779	80	1402563
apomix	Ethanol 70% pure...	54A170613	31055	40	not required
Kremer GmbH &...	Ethanol 70% pure...	171211	34101	40	not required
apomix	Ethanol 70% pure...	08A060618	34274	40	not required

Validation samples

A total of 48 238 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 200 spectra of 4 reference samples from the substance/substance group *Ethanol 70% pure / denatured*. These samples are listed above in the [calibration samples](#) section.
- 20 478 spectra from a total of 482 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 120 spectra of 3 reference samples from the substance/substance group *Ethanol 70% pure / denatured*.

Supplier	Substance	Batch	Sample ID	Spectra
Hofmann's	Ethanol 70% pure / denatured	570916	32591	40
apomix	Ethanol 70% pure / denatured	01A020117	33217	40
Hofmann's	Ethanol 70% pure / denatured	750718	34317	40

- 23 228 spectra from a total of 575 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 298 spectra from 89 *Apo-Ident* customers from 248 batches from the substance/substance group *Ethanol 70% pure / denatured*.

Supplier	Substance	Batch	Spectra
A.Pflüger	Ethanol 70% pure / denatured	21111301	1

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Supplier	Substance	Batch	Spectra
Caelo	Ethanol 70% pure / denatured		1
Noweda	Ethanol 70% pure / denatured	120420	1
Defektur	Ethanol 70% pure / denatured	4712M-02320	1
Sanacorp	Ethanol 70% pure / denatured	130124	1
Gutenberg-Apotheke	Ethanol 70% pure / denatured	3412I-03043	1
Eigenherstellung	Ethanol 70% pure / denatured	1313I-02320	1
Apomix	Ethanol 70% pure / denatured	6A040213	1
Kremer	Ethanol 70% pure / denatured	130206	1
Purren Apotheke	Ethanol 70% pure / denatured	17043	1
Plüger/Anzag	Ethanol 70% pure / denatured	32016	1
Kremer/Gehe	Ethanol 70% pure / denatured	130116	1
Eigenherstellung	Ethanol 70% pure / denatured	1823	1
Gutenberg-Apotheke	Ethanol 70% pure / denatured	130502003	1
Heck/Wittich	Ethanol 70% pure / denatured	2113N-02320	1
Eigenherstellung	Ethanol 70% pure / denatured	2613I-03043	1
Stern-Defektur	Ethanol 70% pure / denatured	130705003	1
Defektur	Ethanol 70% pure / denatured	270613Et0H	1
Eigenherstellung	Ethanol 70% pure / denatured	2753	1
Doppeleiche Apotheke	Ethanol 70% pure / denatured	3013A-02320	1
Hohe-Wart-Apotheke	Ethanol 70% pure / denatured	23072013/1	1
eigen	Ethanol 70% pure / denatured		2
Euro OTC	Ethanol 70% pure / denatured	220713	1
A. Pflüger/Phönix	Ethanol 70% pure / denatured	130607	1
A.Pflüger/Noweda	Ethanol 70% pure / denatured	130116	1
Pflüger	Ethanol 70% pure / denatured	130607	1
A.Pflüger GmbH & Co.KG/...	Ethanol 70% pure / denatured	130514	1
Kremer GmbH Wuppertal/G...	Ethanol 70% pure / denatured	130729	1
Eigenherstellung	Ethanol 70% pure / denatured	3413I-02320	1
frischhergestellt	Ethanol 70% pure / denatured		1
A. Pflüger/Phönix	Ethanol 70% pure / denatured	130729	1
Hofmann	Ethanol 70% pure / denatured	320713	1
Kemer Phönix	Ethanol 70% pure / denatured	130628	1
Gutenberg-Apotheke	Ethanol 70% pure / denatured	1813M-02320	1
Berkel AHK	Ethanol 70% pure / denatured	20042012397	1
Hirsch	Ethanol 70% pure / denatured	4413I-02320	1
Eigenherstellung	Ethanol 70% pure / denatured	4513I-02320	1
Belous	Ethanol 70% pure / denatured	4613E-02320	1
Kremer/Noweda	Ethanol 70% pure / denatured	131011	1
Martinus-Apotheke	Ethanol 70% pure / denatured	A-311013-1D	1
Noweda/KremerGmbH	Ethanol 70% pure / denatured	130821	1
Fagron	Ethanol 70% pure / denatured	Probemessung	1
Eigenherstellung	Ethanol 70% pure / denatured	4733	1
A. Pflüger/Jenne	Ethanol 70% pure / denatured	131108	1
Hubertus Apotheke	Ethanol 70% pure / denatured	261113	1
Martinus-Apotheke	Ethanol 70% pure / denatured	A-061213-3D	1
Fischar / Sanacorp	Ethanol 70% pure / denatured	7023091	1
A.Pflüger GmbH & Co.KG/...	Ethanol 70% pure / denatured	131011	1
Berkel AHK/HWA	Ethanol 70% pure / denatured	1410T31040613/70	1
eigene Herstellung	Ethanol 70% pure / denatured	4411312106	1
Eigene Herstellung	Ethanol 70% pure / denatured	SPV7025	1
Doppeleiche Apotheke	Ethanol 70% pure / denatured	131227003	1
Eigenherstellung	Ethanol 70% pure / denatured	5131213	1
Post-Apotheke 15.01.2014	Ethanol 70% pure / denatured	15012044	1
Martinus-Apotheke	Ethanol 70% pure / denatured	E-100114-1D	1
Fischar / Anzag	Ethanol 70% pure / denatured	7023091	1
Defektur	Ethanol 70% pure / denatured	200114Et0H70	1
Eigenherstellung	Ethanol 70% pure / denatured		1
Pflüger	Ethanol 70% pure / denatured	131108	2
Fischar / Noweda	Ethanol 70% pure / denatured	7023111	1
Phönix	Ethanol 70% pure / denatured	351213	1

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Supplier	Substance	Batch	Spectra
Martinus-Apotheke	Ethanol 70% pure / denatured	E-020314-1D	1
Eigenproduktion	Ethanol 70% pure / denatured	714Q-02320	1
Hirsch	Ethanol 70% pure / denatured	714E-02320	1
Kremer/Gehe	Ethanol 70% pure / denatured	140121	1
Caelo	Ethanol 70% pure / denatured	814E-02320	1
Doppeleiche Apotheke	Ethanol 70% pure / denatured	140303003	1
Gehe 27.2.14	Ethanol 70% pure / denatured	140121	1
eigene herstellung	Ethanol 70% pure / denatured	SPV7026	1
eigene Herstellung	Ethanol 70% pure / denatured	431140218	1
Post-Apotheke	Ethanol 70% pure / denatured	1414A-02320	1
Wolf-Apotheke	Ethanol 70% pure / denatured	40331/52La	1
Caelo	Ethanol 70% pure / denatured	20140403	1
Rondell Apotheke	Ethanol 70% pure / denatured	1814Q-07145	1
Gehe-Kremer	Ethanol 70% pure / denatured	140307	1
Martinus-Apotheke	Ethanol 70% pure / denatured	E-080514-1D	1
	Ethanol 70% pure / denatured		1
Eigenherstellung	Ethanol 70% pure / denatured	2124	1
KremperGmbH & Co. KG	Ethanol 70% pure / denatured	140507	1
Fischar / Noweda	Ethanol 70% pure / denatured	7024021	1
Otto Fischar	Ethanol 70% pure / denatured	7023111	1
Defektur	Ethanol 70% pure / denatured	23/14	1
Caelo	Ethanol 70% pure / denatured	2614E-03043	1
Eigenherstellung	Ethanol 70% pure / denatured	2314I-02320	1
Doppeleiche Apotheke	Ethanol 70% pure / denatured	140630003	1
Martinus-Apotheke	Ethanol 70% pure / denatured	E-180714-1D	1
Wolf-Apotheke / Defektur	Ethanol 70% pure / denatured	40722/51Hk	1
Kastner (eigen)	Ethanol 70% pure / denatured	3114E-03043	1
Caelo	Ethanol 70% pure / denatured	7023111	1
Rondell Apotheke	Ethanol 70% pure / denatured	3414M-02320	1
Rondell Apotheke	Ethanol 70% pure / denatured	3414M-07145	1
Kremer GmbH / Noweda	Ethanol 70% pure / denatured	140627	1
Fischar	Ethanol 70% pure / denatured	7024051	1
Doppeleiche Apotheke	Ethanol 70% pure / denatured	140927002	1
Otto Fischar GmbH & Co...	Ethanol 70% pure / denatured	7024021	1
Fagron	Ethanol 70% pure / denatured	40929/52La	1
Römer-Apotheke	Ethanol 70% pure / denatured	4314A-03043	1
Doppeleiche Apotheke	Ethanol 70% pure / denatured	141029011	1
Eigenherstellung	Ethanol 70% pure / denatured	4414A-02320	1
HirschApotheke	Ethanol 70% pure / denatured	4614A-02320	1
Anzag/ Otto Fischar GmbH...	Ethanol 70% pure / denatured	7024051	1
Defektur	Ethanol 70% pure / denatured	4714E-03043	1
Kremer	Ethanol 70% pure / denatured	141027	1
Pflüger	Ethanol 70% pure / denatured	141027	1
Wolf-Apotheke / Defektur	Ethanol 70% pure / denatured	41125/52Hk	1
Doppeleiche Apotheke	Ethanol 70% pure / denatured	141208001	1
Defektur/Wolf-Apotheke	Ethanol 70% pure / denatured	41211/51Hk	1
Martinus-Apotheke	Ethanol 70% pure / denatured	E-121214-1D	1
Kremer/Phönix	Ethanol 70% pure / denatured	141127	1
Eigenherstellung	Ethanol 70% pure / denatured	5214A-02320	1
Otto Fischar GmbH & Co...	Ethanol 70% pure / denatured	7024071	1
Kremer GmbH / Noweda	Ethanol 70% pure / denatured	141127	2
Doppeleiche Apotheke	Ethanol 70% pure / denatured	150114010	1
A. Pflüger GmbH & Co. KG	Ethanol 70% pure / denatured	141127	1
Doppeleiche Apotheke	Ethanol 70% pure / denatured	150126002	1
Rondell Apotheke	Ethanol 70% pure / denatured	615E-02320	1
Rondell Apotheke	Ethanol 70% pure / denatured	615E-07145	1
Doppeleiche Apotheke	Ethanol 70% pure / denatured	150219007	1
HirschApotheke	Ethanol 70% pure / denatured	10151-02320	1
Kastner (eigen)	Ethanol 70% pure / denatured	1215E-02320	1
Fischar	Ethanol 70% pure / denatured	27031501	1

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Supplier	Substance	Batch	Spectra
otto Fischer/Noweda	Ethanol 70% pure / denatured	7024121	1
Eigenherstellung	Ethanol 70% pure / denatured	1515I-02320	1
Libellen Apotheke	Ethanol 70% pure / denatured	1515Q-02320	1
Brinn- Holtz	Ethanol 70% pure / denatured	1234-04/18	1
Rondell	Ethanol 70% pure / denatured	1715E-07145	1
Caelo	Ethanol 70% pure / denatured	1715E-02320	1
Stiftsapotheke	Ethanol 70% pure / denatured	150420005	1
Defektur	Ethanol 70% pure / denatured	50427/52W1o	1
Defektur	Ethanol 70% pure / denatured	50427/1La	1
Gehe-Kremer	Ethanol 70% pure / denatured	150209	1
Doppeleiche Apotheke	Ethanol 70% pure / denatured	150504003	1
Kremer GmbH & Co.KG	Ethanol 70% pure / denatured	140902	2
Caelo	Ethanol 70% pure / denatured	1915I-02320	1
Eigenherstellung	Ethanol 70% pure / denatured	2015E-02320	1
Apotärze	Ethanol 70% pure / denatured	2015I-02320	1
Kremer/Phönix	Ethanol 70% pure / denatured	150327	1
Defektur	Ethanol 70% pure / denatured	2015Q-03043	1
Gehe/Pflüger	Ethanol 70% pure / denatured	1204021712	1
Martinus-Apotheke	Ethanol 70% pure / denatured	E-050515-1D	1
Apomix/Alliance Healthc...	Ethanol 70% pure / denatured	15A170215	1
HirschApotheke	Ethanol 70% pure / denatured	2315I-02320	1
A. Pflüger GmbH & Co. KG	Ethanol 70% pure / denatured	150209	1
eigene Herstellung	Ethanol 70% pure / denatured	6180115	1
Brinn- Holtz	Ethanol 70% pure / denatured	1257-06/17	1
Otto Fischar GmbH/ Amzag	Ethanol 70% pure / denatured	7024091	1
Defektur/Wolf-Apotheke	Ethanol 70% pure / denatured	50714/51Hk	1
Rondell Apotheke	Ethanol 70% pure / denatured	2615I-07145	1
Apotheke im Forum	Ethanol 70% pure / denatured	150707	1
Defektur/Wolf-Apotheke	Ethanol 70% pure / denatured	50714/53Hk	1
Kremer GmbH & Co.KG	Ethanol 70% pure / denatured	150602	1
Eigene Herstellung	Ethanol 70% pure / denatured	SP70140	1
Eigene Herstellung	Ethanol 70% pure / denatured	SPV7029	1
Apomix/Noweda	Ethanol 70% pure / denatured	58A020715	1
Klenk	Ethanol 70% pure / denatured	150730	1
Apomix/Alliance Healthc...	Ethanol 70% pure / denatured	56a020715	1
A.Pflüger GmbH	Ethanol 70% pure / denatured	150730	1
Otto Fischer / Noweda	Ethanol 70% pure / denatured	7025031	1
Met/ Noweda	Ethanol 70% pure / denatured	3815M-03043	1
Kremer/Phoenix	Ethanol 70% pure / denatured	150730	1
apomix	Ethanol 70% pure / denatured	77A310815	1
Rondell Apotheke	Ethanol 70% pure / denatured	4015A-03043	1
Eigenherstellung	Ethanol 70% pure / denatured	4215I-02320	1
Wolf-Apotheke / Defektur	Ethanol 70% pure / denatured	51019/51W1o	1
Engel/Engel	Ethanol 70% pure / denatured	39-28715	1
Caelo	Ethanol 70% pure / denatured	150730	1
Rezeptur	Ethanol 70% pure / denatured	4215Q-03043	1
eigene Herstellung	Ethanol 70% pure / denatured	4315Q-07016	1
Apomix / Phönix	Ethanol 70% pure / denatured	41A180515	1
Eigenherstellung	Ethanol 70% pure / denatured	4615	1
Otto Fischar GmbH & Co...	Ethanol 70% pure / denatured	7025031	2
Defektur/Wolf-Apotheke	Ethanol 70% pure / denatured	1234567	2
Eigenherstellung	Ethanol 70% pure / denatured	4715M	1
Defektur	Ethanol 70% pure / denatured		2
Caelo	Ethanol 70% pure / denatured	7025081	1
Caelo	Ethanol 70% pure / denatured	151008	2
Rondell Apotheke	Ethanol 70% pure / denatured	416M-02320	1
Fischar	Ethanol 70% pure / denatured	7025082	1
Rondell Apotheke	Ethanol 70% pure / denatured	415M-03043	1
Kremer/Phönix	Ethanol 70% pure / denatured	151123	1
Eigenherstellung	Ethanol 70% pure / denatured	616Q-02320	1

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Supplier	Substance	Batch	Spectra
Defektur	Ethanol 70% pure / denatured	60209/51Hk	1
Eigen	Ethanol 70% pure / denatured	616Q-03043	2
Caelo	Ethanol 70% pure / denatured	60307/50La	1
Eigen/Defektur	Ethanol 70% pure / denatured	1116E-03043	1
Claudia Lange	Ethanol 70% pure / denatured	1234	1
sittig	Ethanol 70% pure / denatured	310316	1
Dreikönigen Apotheke	Ethanol 70% pure / denatured	16049021	1
Defektur	Ethanol 70% pure / denatured	1716M-03043	1
Kremer/Gehe	Ethanol 70% pure / denatured	160414	2
Stiftsapotheke	Ethanol 70% pure / denatured	13052016	1
Eigenherstellung	Ethanol 70% pure / denatured	2216A-02320	1
Apomix / Alliance Healt...	Ethanol 70% pure / denatured	37A110416	1
Kremer	Ethanol 70% pure / denatured	160414	1
Wolf-Apotheke / Defektur	Ethanol 70% pure / denatured	Bulk	1
Rezeptur Apotheke	Ethanol 70% pure / denatured	2016Q-03043	1
Eigen/Defektur	Ethanol 70% pure / denatured	2516M-03043	1
Rondell Apotheke	Ethanol 70% pure / denatured	2616M-02320	1
Eigen/Defektur	Ethanol 70% pure / denatured	2716M-03043	1
apomix/Phoenix	Ethanol 70% pure / denatured	12A250116	1
Martinus-Apotheke	Ethanol 70% pure / denatured	E-110716-1D	1
Berkel AHK	Ethanol 70% pure / denatured		1
Fischar/Phönix	Ethanol 70% pure / denatured	7026031	1
Eigen	Ethanol 70% pure / denatured	3216E-03043	1
Eigen/Defektur	Ethanol 70% pure / denatured	3416E-03043	1
kremer gmbh	Ethanol 70% pure / denatured	23081605	1
Defektur / Wolf-Apotheke	Ethanol 70% pure / denatured	60902/50Hk	1
Claudia Lange	Ethanol 70% pure / denatured	60919/50La	1
Eigenherstellung	Ethanol 70% pure / denatured	3416E-02320	1
Kremer GmbH	Ethanol 70% pure / denatured	160512	1
Claudia Lange	Ethanol 70% pure / denatured	61010/51La	1
Kremer GmbH & Co. KG	Ethanol 70% pure / denatured	160215	1
Martinus-Apotheke	Ethanol 70% pure / denatured	E-021116-1D	1
Claudia Lange	Ethanol 70% pure / denatured	61107/50La	1
Kremer	Ethanol 70% pure / denatured	161017	1
Eigen	Ethanol 70% pure / denatured	5016E-03043	1
kruppa	Ethanol 70% pure / denatured	1216H4	1
Apotheke	Ethanol 70% pure / denatured	70105/51Dre	1
Hoffmann & Sommer GmbH ...	Ethanol 70% pure / denatured	580916	1
eigene Herstellung	Ethanol 70% pure / denatured	317E-02320	1
Eigenherstellung	Ethanol 70% pure / denatured	517Q-02320	1
Apotheke	Ethanol 70% pure / denatured	70206/53Dre	1
Fischar / Alliance Hea...	Ethanol 70% pure / denatured	7026051	1
Pflüger GmbH & Co.KG	Ethanol 70% pure / denatured	170116	1
Phönix/Kremer	Ethanol 70% pure / denatured	160909	1
Defektur/Wolf-Apotheke	Ethanol 70% pure / denatured	70227/52Dre	1
Hoffmanns/Anzag	Ethanol 70% pure / denatured	520116	1
Kremer	Ethanol 70% pure / denatured	170208	1
Rosen Apotheke	Ethanol 70% pure / denatured	1317A-07095	1
Wolf-Apotheke / Defektur	Ethanol 70% pure / denatured	70404/53Hk	1
Kremer GmbH & Co. KG	Ethanol 70% pure / denatured	170208	1
Euro OTC	Ethanol 70% pure / denatured	170116	1
Kremer GmbH & Co. KG	Ethanol 70% pure / denatured	161017	1
Fischar/Phönix	Ethanol 70% pure / denatured	7026111	1
Fischar/Phönix	Ethanol 70% pure / denatured	7026092	1
Rosenapotheke	Ethanol 70% pure / denatured	2317E-07095	1
Apotheke im Forum	Ethanol 70% pure / denatured	300517	1
Gehe/Pflüger	Ethanol 70% pure / denatured	170308	1
Gehe/Pflüger	Ethanol 70% pure / denatured	170208	1
Gehe/Pflüger	Ethanol 70% pure / denatured	170419	2
Defektur	Ethanol 70% pure / denatured	2517A-07097	1

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Supplier	Substance	Batch	Spectra
Kremer	Ethanol 70% pure / denatured	170308	1
Wolf Apotheke/Defektur	Ethanol 70% pure / denatured	70627/52Hk	1
Kremer GmbH &Co. KG	Ethanol 70% pure / denatured	170116	2
Defektur	Ethanol 70% pure / denatured	2617I-07097	1
Eigen	Ethanol 70% pure / denatured	Eigen	1
fischar/Phönix	Ethanol 70% pure / denatured	7027032	1
n.a.	Ethanol 70% pure / denatured	1707918-a	1
kruppa	Ethanol 70% pure / denatured	617H4	1
Wolf-Apotheke-Defektur	Ethanol 70% pure / denatured	70818/50Hk	1
Pflüger/Gehe	Ethanol 70% pure / denatured	170619	1
Kremer GmbH &Co. KG	Ethanol 70% pure / denatured	170619	4
EIGEN	Ethanol 70% pure / denatured	4117I-03043	1
Kremer/Noweda	Ethanol 70% pure / denatured	170906	1
Defektur	Ethanol 70% pure / denatured	71016/51Dre	1
Kremer GmbH	Ethanol 70% pure / denatured	170906	1
eigene Herstellung	Ethanol 70% pure / denatured	1712904-A	1
Wolf Apotheke/Defektur	Ethanol 70% pure / denatured	71208/50Gie	1
Kremer/Alliance Healthc. ...	Ethanol 70% pure / denatured	171025	1
eigene	Ethanol 70% pure / denatured	1018E-02320	1
Pflüger	Ethanol 70% pure / denatured	170906	1
Caelo	Ethanol 70% pure / denatured	171211	1
Defektur	Ethanol 70% pure / denatured	80316/51Gie	1
Kruppa	Ethanol 70% pure / denatured	418H2	1
Pflüger	Ethanol 70% pure / denatured	180308	1
Pflüger	Ethanol 70% pure / denatured	171025	1
Defektur	Ethanol 70% pure / denatured	80321/50Hk	1
EIGEN	Ethanol 70% pure / denatured	2118I-03043	1
Fischar	Ethanol 70% pure / denatured	7028031	1
Defektur	Ethanol 70% pure / denatured	80611/51Dre	1
Phönix/Kremer	Ethanol 70% pure / denatured	180525	1
Kremer/Phönix	Ethanol 70% pure / denatured	180404	1
Fischar	Ethanol 70% pure / denatured	7028011	1
Kruppa	Ethanol 70% pure / denatured	818H2	1
Defektur	Ethanol 70% pure / denatured	3098	1
Gehe	Ethanol 70% pure / denatured	3818Q-02320	1
Eigene Herstellung	Ethanol 70% pure / denatured	3618I-02320	1
Kremer/Phönix	Ethanol 70% pure / denatured	180928	1
Otto Fischer GmbH&Co.KG. ...	Ethanol 70% pure / denatured	7028091	1
Gehe/Pflüger	Ethanol 70% pure / denatured	180928	1
Eigenherstellung	Ethanol 70% pure / denatured	5318A-02320	1
EIGEN	Ethanol 70% pure / denatured	5218M-03043	1
Löwen-Apotheke	Ethanol 70% pure / denatured	219Q-03043	1

- 3914 spectra from 386 *Apo-Ident* customers from a total of 1864 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Ethanol 70% pure / denatured* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ethanol 70% pure / denatured* and it was evaluated how many matches (positive) and rejections (negative) were correct

or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 478
Type B	0	120	0	23 228
Type C	0	282	16	3914

The substance/substance group *Ethanol 70% pure / denatured* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9554 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9508 %)	100.0000 % (> 95.0000 %)
Type C	100.0000 % (> 98.5347 %)	94.6309 % (> 93.6242 %)

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

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

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

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
31055	31055	0.00	83.65
30779	30779	0.00	102.02
34274	34274	0.00	82.70
34101	34101	0.00	96.40

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Excipial® almond oil ointment**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 30720-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Excipial® almond oil ointment

Special notes

When selecting the *Excipial® almond oil ointment* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Excipial® almond oil ointment*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Spirig Pharma	Excipial® almond...	M023	30720	40	not required
Spirig Pharma	Excipial® almond...	M031	31090	40	not required
Spirig Pharma	Excipial® almond...	N012	31278	40	not required
Spirig Pharma	Excipial® almond...	R012	31757	40	not required

Validation samples

A total of 48 238 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 *Excipial[®] almond oil ointment*. These samples are listed above in the [calibration samples](#) section.
- 20 518 spectra from a total of 482 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 100 spectra of 3 reference samples from the substance/substance group *Excipial[®] almond oil ointment*.

Supplier	Substance	Batch	Sample ID	Spectra
Spirig Pharma	Excipial [®] almond oil ointment	R012	31757 [†]	20
Spirig Pharma	Excipial [®] almond oil ointment	S021	33209	40
Spirig Pharma	Excipial [®] almond oil ointment	T052	33210	40

- 23 248 spectra from a total of 575 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 28 spectra from 11 *Apo-Ident* customers from 24 batches from the substance/substance group *Excipial[®] almond oil ointment*.

[†]These spectra were recorded from 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
Spirig/Sanacorp	Excipial [®] almond oil ointment	LOTN011	1
Spirig	Excipial [®] almond oil ointment	M032	1
Spirig/AHD	Excipial [®] almond oil ointment	N011	1
Spirig	Excipial [®] almond oil ointment	LOTM023	1
Spirig / Gehe	Excipial [®] almond oil ointment	LOTN022	1
Caelo	Excipial [®] almond oil ointment	LOTN022	2
Spirig	Excipial [®] almond oil ointment	M023	1
Spirig	Excipial [®] almond oil ointment	N032	1
Spirig	Excipial [®] almond oil ointment	N031	1
Spirig	Excipial [®] almond oil ointment	R012	1
Caelo	Excipial [®] almond oil ointment	lotno32	1
Spirig Pharma/Nowed	Excipial [®] almond oil ointment	N022	1
Spirig /Noweda	Excipial [®] almond oil ointment	R012	1
Spirig /Noweda	Excipial [®] almond oil ointment	r021	1
Spirig/Noweda	Excipial [®] almond oil ointment	R043	1
Galderma/Noweda	Excipial [®] almond oil ointment	S012	1
Galderma (Spirig Pharma...	Excipial [®] almond oil ointment	R043	1
Spirig	Excipial [®] almond oil ointment	S032	1
Galderma	Excipial [®] almond oil ointment	R043	1
Spirig	Excipial [®] almond oil ointment	S011	1
Galderma/Now	Excipial [®] almond oil ointment	L0TS021	1
Galderma/Kehr	Excipial [®] almond oil ointment	T051	1
Caelo	Excipial [®] almond oil ointment	20170829Ma2	1
Caelo	Excipial [®] almond oil ointment	20170829Ma3	1
Galderma/Kehr	Excipial [®] almond oil ointment	V031	1
Galderma-Spirig	Excipial [®] almond oil ointment	V042-20171127Ma12	1
Spirig / Galderma / Anzag	Excipial [®] almond oil ointment	V061	1

- 4184 spectra from 396 *Apo-Ident* customers from a total of 2095 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Excipial[®] almond oil ointment* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Excipial[®] almond oil ointment* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 518
Type B	0	100	0	23 248
Type C	0	27	1	4184

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9555 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9509 %)	100.0000 % (> 94.0000 %)
Type C	100.0000 % (> 98.5370 %)	96.4286 % (> 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
31757	31757	0.00	23.18
30720	30720	0.00	31.17
31278	31278	0.00	26.02
31090	31090	0.00	24.57

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Fat ointments**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 30881-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Fat ointments; Asche Basis[®] fat ointment; Cottonwood ointment; Marjoram ointment; Neribas[®] fat ointment; Protegin[®] XN; Unguentum majoranae; Unguentum Populi

Special notes

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

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Fat ointments*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Marjoram ointment	12123001	30881	40	not required
Henry Lamotte	Marjoram ointment	5322500	30926	40	not required
Chiesi	Asche Basis [®] fat...	23014A	31013	40	not required
Caelo	Protegin [®] XN	13081901	31112	40	not required

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Marjoram ointment	14089901	31443	40	not required
Caelo	Protegin [®] XN	13344402	31475	40	not required
Jenapharm	Neribas [®] fat oin...	32032C	31489	40	not required
Chiesi	Asche Basis [®] fat...	41017A	31858	40	not required
Jenapharm	Neribas [®] fat oin...	YY00K7C	31872	40	not required
Caelo	Cottonwood ointm...	161175	32473	40	20160607*
Caelo	Cottonwood ointm...	170572	33130	40	20170307*
Caelo	Cottonwood ointm...	170573	33131	40	20170308*
Chiesi	Asche Basis [®] fat...	53021A	33634	40	not required
Caelo	Protegin [®] XN	17258703	33921	40	not required
Jenapharm	Neribas [®] fat oin...	YY01TF2	33986	40	not required

Validation samples

A total of 48 238 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 600 spectra of 15 reference samples from the substance/substance group *Fat ointments*. These samples are listed above in the [calibration samples](#) section.
- 20 078 spectra from a total of 471 batches from further 154 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 720 spectra of 18 reference samples from the substance/substance group *Fat ointments*.

Supplier	Substance	Batch	Sample ID	Spectra
Chiesi	Asche Basis [®] fat ointment	41017A	31858 [†]	20
Jenapharm	Neribas [®] fat ointment	YY00K7C	31872 [†]	20
Caelo	Marjoram ointment	153533	31990	60
Caelo	Marjoram ointment	153540	31991	60
Caelo	Protegin [®] XN	161645	32340	40
Caelo	Marjoram ointment	160687	32516	40
Chiesi	Asche Basis [®] fat ointment	53021A	32716	40
Jenapharm	Neribas [®] fat ointment	YY011K0	32764	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	Marjoram ointment	162575	32872	40
Caelo	Marjoram ointment	162576	32873	40
Chiesi	Asche Basis [®] fat ointment	53021A	32925	40
Caelo	Cottonwood ointment	170534	33162	40
Caelo	Cottonwood ointment	170574	33163	40
Jenapharm	Neribas [®] fat ointment	YY019KR	33290	40
Caelo	Cottonwood ointment	180826	34186	40
Caelo	Cottonwood ointment	180828	34187	40
Caelo	Cottonwood ointment	181888	34256	40
Caelo	Marjoram ointment	181900	34259	40

- 22 628 spectra from a total of 561 batches from further 199 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 382 spectra from 133 *Apo-Ident* customers from 138 batches from the substance/substance group *Fat ointments*.

Supplier	Substance	Batch	Spectra
Caelo	Protegin [®] XN	14220205	6
Phönix	Protegin [®] XN	11196706	1
Caelo	Protegin [®] XN	11196702	2
Caelo	Protegin [®] XN	3091208	1
Caelo	Protegin [®] XN	11196801	1
Caelo	Protegin [®] XN	11022403	1
	Protegin [®] XN	2711E-03598	1
Caelo	Protegin [®] XN	11196805	1
Caelo	Protegin [®] XN	12229201	5
Gehe	Protegin [®] XN	12229201	1
Caelo	Protegin [®] XN	8031305	1
Phönix 12.03.2013	Protegin [®] XN	12229205	1
Caelo	Protegin [®] XN	12229211	5
Gehe	Protegin [®] XN	12229211	1
Caelo	Protegin [®] XN	12229210	1
Caelo	Protegin [®] XN	25061301	1
Phönix	Protegin [®] XN	13081901	3
Caelo	Protegin [®] XN	13081901	4
Caelo	Protegin [®] XN	13081902	2
Caelo	Protegin [®] XN	12229209	1
Phönix, 07.11.13	Protegin [®] XN	12229210	1
Caelo	Protegin [®] XN	13081905	11
Caelo	Protegin [®] XN	13081903	1
Caelo	Protegin [®] XN	13081908	1
Caelo	Protegin [®] XN	6012014A	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	Protegin [®] XN	13081906	6
Caelo	Protegin [®] XN	20011402	1
Caelo	Protegin [®] XN	13081904	2
Caelo	Protegin [®] XN	13344402	11
Caelo	Protegin [®] XN	13344401	5
Caelo	Protegin [®] XN	13081907	3
Caelo	Protegin [®] XN	14220203	2
Caelo	Protegin [®] XN	14220204	3
Caelo	Protegin [®] XN	14220202	4
Caelo	Protegin [®] XN	14220201	1
Caelo	Protegin [®] XN	14341301	3
Caelo	Protegin [®] XN	26031509	1
Caelo	Protegin [®] XN	14341302	1
Caelo	Protegin [®] XN	14220208	4
Caelo	Protegin [®] XN	14220209	3
Caelo	Protegin [®] XN	14220206	2
Caelo	Protegin [®] XN	15252703	5
Caelo	Protegin [®] XN	15252702	1
Caelo	Protegin [®] XN	16026701	6
Gehe	Protegin [®] XN	16026701	2
Caelo	Protegin [®] XN	16026703	3
Caelo	Protegin [®] XN	16026704	3
Caelo	Protegin [®] XN	16026702	3
Caelo	Protegin [®] XN	16026707	5
Caelo	Protegin [®] XN	16026706	1
Caelo	Protegin [®] XN	16026709	1
Caelo	Protegin [®] XN	16164502	2
Caelo	Protegin [®] XN	16164506	2
Caelo	Protegin [®] XN	16164503	2
Ichthyol-Gesellschaft	Protegin [®] XN	17258703	1
Euro OTC	Protegin [®] XN		1
Caelo	Protegin [®] XN	17258705	1
Caelo	Protegin [®] XN	17258708	1
Hedinger/Phönix	Protegin [®] XN	18059501	1
Caelo	Protegin [®] XN	17258707	1
Caelo	Protegin [®] XN	17258703	1
Caelo	Protegin [®] XN	18059502	3
Caelo	Protegin [®] XN	18059501	1
Klenk	Protegin [®] XN	18059502	1
Fagron	Protegin [®] XN	18059501	1
Kehr	Protegin [®] XN	1805607	1
Caelo	Marjoram ointment	11274603	2
Caelo	Marjoram ointment	11327501	2
Caelo	Marjoram ointment	11061201	1
Henry Lamotte GmbH/Hold...	Marjoram ointment	5067400	1
Henry Lamotte Oils GmbH...	Marjoram ointment	5067400	1
Caelo	Marjoram ointment	15101205	1
Caelo	Marjoram ointment	12081002	5
Caelo	Marjoram ointment	12018001	4
Caelo	Marjoram ointment	12018101	3
Fagron	Marjoram ointment	12D24-T01	2
Phönix	Marjoram ointment	12018001	1
Caelo	Marjoram ointment	7121203	1
Lamotte / Gehe	Marjoram ointment	5322500	1
Phönix 10.12.12	Marjoram ointment	12D24-T02	1
Caelo	Marjoram ointment	12123101	2
Caelo	Marjoram ointment	20290312-1	1
Caelo	Marjoram ointment	12123001	7
Fagron	Marjoram ointment	12081002	1
Sanacorp	Marjoram ointment	12081002	1

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Supplier	Substance	Batch	Spectra
Lamotte/ Noweda	Marjoram ointment	5322500	1
Noweda	Marjoram ointment	5322500	1
Caelo	Marjoram ointment	12295402	6
Caelo	Marjoram ointment	8031304	1
Caelo	Marjoram ointment	5322500	1
Caelo	Marjoram ointment	1225402	1
Phoenix	Marjoram ointment	13028401	1
Cealo	Marjoram ointment	13028401	2
Caelo	Marjoram ointment	13051304	1
Caelo	Marjoram ointment	13028301	2
Caelo	Marjoram ointment	13028401	9
Henry Lamotte Oils GmbH	Marjoram ointment	5322500	1
Caelo	Marjoram ointment	13028302	3
Jenne	Marjoram ointment	13028302	2
Henry Lamotte Oils GmbH...	Marjoram ointment	5322500	1
Caelo	Marjoram ointment	1513E-02536	1
Caelo	Marjoram ointment	13095401	5
Sanacorp	Marjoram ointment	12295402	1
Caelo	Marjoram ointment	13307102	6
Fagron	Marjoram ointment	13A16-To4-000208	1
Gehe	Marjoram ointment	13307102	1
Caelo	Marjoram ointment	2011405	1
Lamotte/Alliance	Marjoram ointment	5563400	4
Fagron	Marjoram ointment	13A16-T02	1
Sanacorp	Marjoram ointment	13095401	1
Caelo	Marjoram ointment	13382902	1
Caelo	Marjoram ointment	14002101	15
Caelo	Marjoram ointment	13382903	2
Caelo	Marjoram ointment	13382901	1
Fagron	Marjoram ointment	13A16-T04-000208	1
Caelo	Marjoram ointment	13e10-t04-003550	1
Caelo	Marjoram ointment	14089901	8
Caelo	Marjoram ointment	140020101	1
Caelo	Marjoram ointment	13383001	1
Fagron	Marjoram ointment	13F27-T03-004962	3
Caelo	Marjoram ointment	10111402	1
Fagron	Marjoram ointment	13F27-To3-004962	1
Henry Lamotte Oils GmbH	Marjoram ointment	5563400	1
Caelo	Marjoram ointment	14090002	10
Caelo	Marjoram ointment	14332202	1
Caelo	Marjoram ointment	2021506	1
VDL	Marjoram ointment	14090002	1
Gehe	Marjoram ointment	14090002	1
Caelo	Marjoram ointment	14332101	8
Caelo	Marjoram ointment	15038401	2
Caelo	Marjoram ointment	27031505	1
Fagron	Marjoram ointment	14A07-T06-009085	3
Fagron	Marjoram ointment	14090002	1
Caelo	Marjoram ointment	15038501	3
Fagron	Marjoram ointment	14A07-T04-009079	3
Caelo	Marjoram ointment	15038303	1
Caelo	Marjoram ointment	15354001	5
Fagron	Marjoram ointment	14A07-T05-009082	2
Caelo	Marjoram ointment	15392402	2
Fagron	Marjoram ointment	15K10-T10-027644	1
Caelo	Marjoram ointment	312115354001	1
Caelo	Marjoram ointment	16068901	5
Fagron	Marjoram ointment	16E02-T02-032846	1
Caelo	Marjoram ointment	16068801	3
Sanacorp	Marjoram ointment	16257502	2

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Supplier	Substance	Batch	Spectra
Sanacorp, 21.03.17, 5,73EUR	Marjoram ointment	16068602	1
Caelo	Marjoram ointment	16257602	1
Fagron	Marjoram ointment	16K07-T20-038496	3
Caelo	Marjoram ointment	15353303	1
Caelo	Marjoram ointment	16K07-T20-038496	1
Caelo	Marjoram ointment	16068602	1
Fagron	Marjoram ointment	17B03-T02-041256	1
Kehr	Marjoram ointment	17071101	1
Caelo	Marjoram ointment	17070901	5
Caelo	Marjoram ointment	17071101	1
Caelo	Marjoram ointment	18190101	1
Chiese	Asche Basis [®] fat ointment	33016A	1
Chiesi	Asche Basis [®] fat ointment	41018A	3
Chiesi/Gehe	Asche Basis [®] fat ointment	51020A	1
Chiesi	Asche Basis [®] fat ointment	51020A	1
Chiesi	Asche Basis [®] fat ointment	63023A	1
Chiese	Asche Basis [®] fat ointment	63023A	1
Chiesi/Gehe	Asche Basis [®] fat ointment	41017A	1
Phoenix	Neribas [®] fat ointment	YY00K7C	1
Caelo	Neribas [®] fat ointment	yy00k7C	1
BAYER/Phönix WE:26.04.1...	Neribas [®] fat ointment	YY011K0	1
GP Grenzach Produktions...	Neribas [®] fat ointment	YY00K7C	1
Jenapharm/Phönix	Neribas [®] fat ointment	YY00K7C	1
Jenapharm/Ahd	Neribas [®] fat ointment	YYo11Ko	1
/ AHD	Neribas [®] fat ointment	YY016LP	2
PhönixWE:18.01.2017 E...	Neribas [®] fat ointment	YY016LP	1
Phoenix WE 24.04.17 -7,...	Neribas [®] fat ointment	YY019KR	1
Jenne	Cottonwood ointment	17057404	1

- 3830 spectra from 376 *Apo-Ident* customers from a total of 1973 batches from a further 130 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	600	0	20 078
Type B	0	720	0	22 588
Type C	0	369	13	3830

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9552 %)	100.0000 % (> 99.0000 %)
Type B	100.0000 % (> 99.9514 %)	100.0000 % (> 99.1667 %)
Type C	100.0000 % (> 98.5346 %)	96.5969 % (> 95.8115 %)

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

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

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

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
31112	31112	0.00	38.29
31475	31475	0.00	39.53
33921	33921	0.00	38.30
32473	32473	0.00	31.29
33130	33130	0.00	30.96
33131	33131	0.00	32.78
30881	30881	0.00	33.91
30926	30926	0.00	40.17
31443	31443	0.00	35.54
31013	31013	0.00	37.15
31858	31858	0.00	46.09
33634	33634	0.00	43.05
31489	31489	0.00	44.74
31872	31872	0.00	49.14
33986	33986	0.00	43.76

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Fenistil® Gel**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 31045-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Fenistil® Gel

Special notes

When selecting the *Fenistil® Gel* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Fenistil® Gel*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Novartis	Fenistil® Gel	N00927A	31045	40	not required
Novartis	Fenistil® Gel	R02021A	31767	40	not required
GSK Consumer ...	Fenistil® Gel	U02364A	33638	40	not required

Validation samples

A total of 48 238 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 *Fenistil® Gel*. These samples are listed above in the [calibration samples](#) section.
- 20 558 spectra from a total of 483 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 100 spectra of 3 reference samples from the substance/substance group *Fenistil® Gel*.

Supplier	Substance	Batch	Sample ID	Spectra
Novartis	Fenistil® Gel	R02021A	31767 [†]	20
Euro OTC	Fenistil® Gel	T02415A	32787	40
Euro OTC	Fenistil® Gel	T02416A	32825	40

- 23 248 spectra from a total of 575 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 0 spectra from 0 *Apo-Ident* customers from 0 batches from the substance/substance group *Fenistil® Gel*.
- 4212 spectra from 396 *Apo-Ident* customers from a total of 2111 batches from a further 135 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), 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*.

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

Validation results

The validation runs checked whether the substance/substance group *Fenistil® Gel* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Fenistil® Gel* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 558
Type B	0	100	0	23 248
Type C	0	0	0	4212

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9556 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9509 %)	100.0000 % (> 94.0000 %)
Type C	100.0000 % (> 98.5344 %)	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
31045	31045	0.00	19.03
31767	31767	0.00	21.36
33638	33638	0.00	21.05

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Fennel oil**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 31140-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Fennel oil; Oleum foeniculum vulgare var. dulce

Special notes

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

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Fennel oil*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Taoasis	Fennel oil	L16813D-111973BAG90451	31140	40	not required
Taoasis	Fennel oil	L35513DN-119762	31693	40	not required
Taoasis	Fennel oil	1806-125039	32795	40	not required

Validation samples

A total of 48 238 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 *Fennel oil*. These samples are listed above in the [calibration samples](#) section.
- 20 558 spectra from a total of 483 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 100 spectra of 3 reference samples from the substance/substance group *Fennel oil*.

Supplier	Substance	Batch	Sample ID	Spectra
Taoasis	Fennel oil	L35513DN-119762	31693 [†]	20
Taoasis	Fennel oil	1806-127213	32952	40
Taoasis	Fennel oil	1861-129086	33991	40

- 23 248 spectra from a total of 575 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 0 spectra from 0 *Apo-Ident* customers from 0 batches from the substance/substance group *Fennel oil*.
- 4212 spectra from 396 *Apo-Ident* customers from a total of 2111 batches from a further 135 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), 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*.

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

Validation results

The validation runs checked whether the substance/substance group *Fennel oil* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Fennel oil* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 558
Type B	0	94	6	23 248
Type C	0	0	0	4212

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9556 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9509 %)	94.0000 % (> 91.0000 %)
Type C	100.0000 % (> 98.5344 %)	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
31693	31693	0.00	85.75
31140	31140	0.00	88.83
32795	32795	0.00	19.49

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Ginger oil**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 30451-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Ginger oil; Oleum zingiber officinalis

Special notes

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

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Ginger oil*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Taoasis	Ginger oil	130114-110686BAG90451	30958	40	not required
Taoasis	Ginger oil	40592A-112718BAG90451	31142	40	not required
Taoasis	Ginger oil	1431020-124656	32270	40	not required
Primavera	Ginger oil	00552A27	34407	40	not required

Validation samples

A total of 48 238 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 *Ginger oil*. These samples are listed above in the [calibration samples](#) section.
- 20 518 spectra from a total of 482 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 80 spectra of 2 reference samples from the substance/substance group *Ginger oil*.

Supplier	Substance	Batch	Sample ID	Spectra
Bombastus	Ginger oil	300690	32569	40
Bombastus	Ginger oil	300690	33014	40

- 23 268 spectra from a total of 577 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 1 spectra from 1 *Apo-Ident* customers from 1 batches from the substance/substance group *Ginger oil*.

Supplier	Substance	Batch	Spectra
Taoasis	Ginger oil	6454-92725	1

- 4211 spectra from 396 *Apo-Ident* customers from a total of 2110 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Ginger oil* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ginger oil* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 518
Type B	0	80	0	23 268
Type C	0	1	0	4211

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9555 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9510 %)	100.0000 % (> 92.5000 %)
Type C	100.0000 % (> 98.6061 %)	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
32270	32270	0.00	28.88
31142	31142	0.00	17.59
30958	30958	0.00	20.07
34407	34407	0.00	30.59

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group	Grapefruit oil organic / Orange oil / Blood oran...
Substance class	APIs & excipients, liquid/semi-solid (other)
Report date	24/05/2019
Report number	30960-2019-05-24
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Grapefruit oil organic / Orange oil / Blood orange oil; Blood orange oil; Grapefruit oil, organic; Oleum citrus paradisi; Oleum citrus sinensis; Orange oil

Special notes

When selecting the *Grapefruit oil organic / Orange oil / Blood orange oil* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
 Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
 AA004 *Erstellung und Validierung eines IdentModul-Updates*
 Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Grapefruit oil organic / Orange oil / Blood orange oil*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Taoasis	Orange oil	121109-110685BAG90451	30960	40	not required
Taoasis	Grapefruit oil, ...	31564-119383	31634	80	not required
Taoasis	Orange oil	33732-12088	31679	40	not required
Taoasis	Grapefruit oil, ...	38755-122181	31781	40	not required

continued on the next page

continued from previous page

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Apotheker Bau...	Grapefruit oil, ...	7.99615.16.02	31853	40	not required
Taoasis	Blood orange oil	494J09	33759	40	not required
Primavera	Blood orange oil	00413G25	33761	40	not required
Primavera	Orange oil	00112K25	33805	40	not required

Validation samples

A total of 48 238 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 *Grapefruit oil organic / Orange oil / Blood orange oil*. These samples are listed above in the [calibration samples](#) section.
- 20 318 spectra from a total of 478 batches from further 156 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 571 spectra of 16 reference samples from the substance/substance group *Grapefruit oil organic / Orange oil / Blood orange oil*.

Supplier	Substance	Batch	Sample ID	Spectra
Taoasis	Grapefruit oil, organic	31564-119383	31634 [†]	40
Taoasis	Orange oil	33732-12088	31679 [†]	20
Taoasis	Grapefruit oil, organic	38755-122181	31781 [†]	20
Apotheker Bauer & Cie	Grapefruit oil, organic	7.99615.16.02	31853 [†]	20
Taoasis	Orange oil	43829C-124974	32790	40
Taoasis	Orange oil	44583A-126780	32902	40
Taoasis	Grapefruit oil, organic	44040A-124468	32979	40
Apotheker Bauer & Cie	Grapefruit oil, organic	7.68413.17.012018-03	33019	40
Primavera	Orange oil	00149A29	33956	40
Taoasis	Orange oil	011855A-1538	34105	40
Primavera	Blood orange oil	00318C26	34175	40
Primavera	Orange oil	00058G26	34180	40
Primavera	Blood orange oil	00111H26	34296	31
Primavera	Blood orange oil	00013A27	34376	40
Primavera	Grapefruit oil, organic	00553M26	34385	40
Primavera	Orange oil	00729L26	34392	40

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*).

- 22 777 spectra from a total of 562 batches from further 201 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 14 spectra from 4 *Apo-Ident* customers from 14 batches from the substance/substance group *Grapefruit oil organic / Orange oil / Blood orange oil*.

Supplier	Substance	Batch	Spectra
Taoasis	Grapefruit oil, organic	40038-123110	1
Taoasis	Grapefruit oil, organic	31564-120540	1
Taoasis	Grapefruit oil, organic	44040A-124468	1
Taoasis	Orange oil	140129-116983	1
Taoasis	Orange oil	140129-118141	1
Taoasis	Orange oil	140129-118790	1
Taoasis	Orange oil	140129-118420	1
Taoasis	Orange oil	42861A-122532	1
Taoasis	Orange oil	42861A-121691	1
Taoasis	Orange oil	122650-123643	1
Bombastus	Orange oil	298756	1
Bombastus	Orange oil	302428	1
Taoasis	Orange oil	43829C-125351	1
BerglandSanacorp	Orange oil	K602772	1

- 4198 spectra from 395 *Apo-Ident* customers from a total of 2097 batches from a further 133 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Grapefruit oil organic / Orange oil / Blood orange oil* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Grapefruit oil organic / Orange oil / Blood orange oil* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 318
Type B	0	571	0	22 777
Type C	0	14	0	4198

Hence, these spectra are not independent and are not of *Type B*.

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9552 %)	100.0000 % (> 98.3333 %)
Type B	100.0000 % (> 99.9507 %)	100.0000 % (> 98.9492 %)
Type C	100.0000 % (> 98.5396 %)	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
31634	31634	0.00	45.09
31781	31781	0.00	47.10
31853	31853	0.00	40.22
33759	33759	0.00	44.61
33761	33761	0.00	43.63
30960	30960	0.00	45.25
31679	31679	0.00	47.22
33805	33805	0.00	45.27

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group	Hydrophilic ointments
Substance class	APIs & excipients, liquid/semi-solid (other)
Report date	24/05/2019
Report number	30634-2019-05-24
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Hydrophilic ointments; Abitima[®] clinic body cream; Abitima[®] clinic face cream; Allergika[®] Base cream; Asche Basis[®] cream; Asche Basis[®] lotion; Base cream Taoasis; Dermatop[®] base cream; DMS[®] base cream classic; DMS[®] base cream high classic; DMS[®] base cream high classic plus; Eucerinum O/W basis; Eucerinum W/O basis; Excipial[®] hydro cream; Excipial[®] U Lipolotio; Excipial[®] U10 Lipolotio; Hans Karrer Lipocream MicroSilver; Hans Karrer Lipolotion MicroSilver; Linola[®] body milk; Lipoderm[®] lotion; Neribas[®] cream; Neuroderm[®] care lotion; Neuroderm[®] moisturising cream

Special notes

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

no information

Applicable documents

978-3-7692-6679-5	<i>European Pharmacopoeia 9th Edition, Basic Version 2017</i> [3]
Komm2.2.40	<i>Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident</i> [4]
AA004	<i>Erstellung und Validierung eines IdentModul-Updates</i>
Appendix F	Addition to the second-stage models

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Hydrophilic ointments*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Intendis	Neribas [®] cream	21076A	30634	40	not required
Spirig Pharma	Lipoderm [®] lotion	K057	30635	40	not required
Chiesi	Asche Basis [®] cream	03117A	30713	40	not required
Infectopharm	Neuroderm [®] moist...	S041214.1	30722	40	not required
Spirig Pharma	Excipial [®] hydro ...	I013	30725	40	not required
Spirig Pharma	Excipial [®] U Lipo...	M042	30732	60	not required
Spirig Pharma	Excipial [®] U10 Li...	M021	30733	60	not required
Chiesi	Asche Basis [®] cream	22197A	30775	40	not required
Chiesi	Asche Basis [®] lot...	21042A	30828	40	not required
Actavis	Abitima [®] clinic ...	46820	30845	40	not required
Beiersdorf	Eucerinum W/O ba...	31230108WA	30993	40	not required
Taoasis	Base cream Taoasis	121205-2276	31041	80	not required
Intendis	Neribas [®] cream	21076A	31050	40	not required
Actavis	Abitima [®] clinic ...	110712	31058	40	not required
Actavis	Abitima [®] clinic ...	051112	31061	40	not required
Spirig Pharma	Excipial [®] U10 Li...	N025	31066	40	not required
Spirig Pharma	Excipial [®] U Lipo...	N031	31067	40	not required
Chiesi	Asche Basis [®] lot...	24049A	31068	40	not required
Infectopharm	Neuroderm [®] care ...	S041204.1	31070	40	not required
Spirig Pharma	Lipoderm [®] lotion	M065	31072	40	not required
Chiesi	Asche Basis [®] cream	24220A	31085	40	not required
Spirig Pharma	Excipial [®] hydro ...	N013	31089	40	not required
Intendis	Neribas [®] cream	21076A	31095	40	not required
Infectopharm	Neuroderm [®] moist...	S021307.1	31102	40	not required
Taoasis	Base cream Taoasis	130124-3021	31115	40	not required
Sanofi aventis	Dermatop [®] base c...	3F031A	31234	40	not required
Koko	DMS [®] base cream ...	L010K13	31236	70	not required
Spirig Pharma	Excipial [®] U Lipo...	N085	31280	40	not required
Spirig Pharma	Excipial [®] U10 Li...	N047	31281	40	not required
Koko	DMS [®] base cream ...	L026G13	31307	40	not required
Koko	DMS [®] base cream ...	L032A14	31308	40	not required
Koko	DMS [®] base cream ...	L014L13	31309	40	not required
Dr. Wolff	Linola [®] body milk	433240	31511	40	not required
Spirig Pharma	Lipoderm [®] lotion	R023	31535	40	not required
Beiersdorf	Eucerinum O/W ba...	41830108WA	31539	40	not required
Taoasis	Base cream Taoasis	141222-4350	31578	40	not required
Hans Karrer G...	Hans Karrer Lipo...	15003	31730	40	not required
Infectopharm	Neuroderm [®] moist...	S101428.1	31761	40	not required
Infectopharm	Neuroderm [®] care ...	S031505.1	31772	40	not required
Koko	DMS [®] base cream ...	L034H15	31869	40	not required
Koko	DMS [®] base cream ...	L041K15	31870	40	not required
Hans Karrer G...	Hans Karrer Lipo...	15008	31873	40	not required
Dr. Wolff	Linola [®] body milk	511750	31874	40	not required
Sanofi aventis	Dermatop [®] base c...	5F056A	32177	40	not required
Koko	DMS [®] base cream ...	L003L15	32178	40	not required
Beiersdorf	Eucerinum W/O ba...	53430208WA	32767	40	not required
Koko	DMS [®] base cream ...	L003H16	32916	40	not required
Actavis	Abitima [®] clinic ...	070915	32997	40	not required
Hans Karrer G...	Hans Karrer Lipo...	15003	33194	40	not required
Hans Karrer G...	Hans Karrer Lipo...	15005	33195	40	not required
Spirig Pharma	Excipial [®] hydro ...	T052	33208	40	not required
Beiersdorf	Eucerinum O/W ba...	64030208WA	33213	40	not required
Galderma Labo...	Excipial [®] U Lipo...	T122	33270	40	not required
Allergika	Allergika [®] Base ...	11/082022	33668	40	not required
Allergika	Allergika [®] Base ...	10/082022	33669	40	not required
Chiesi	Asche Basis [®] lot...	64082A	33737	40	not required
Actavis	Abitima [®] clinic ...	161464	33793	30	not required
Koko	DMS [®] base cream ...	L009K17	33968	40	not required
Actavis	Abitima [®] clinic ...	331017	33969	40	not required
Dr. Wolff	Linola [®] body milk	707930	34043	40	not required

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Infectopharm	Neuroderm [®] care ...	S071706.1	34044	40	not required
Hans Karrer G...	Hans Karrer Lipo...	18002	34117	40	not required
Hans Karrer G...	Hans Karrer Lipo...	18005	34119	40	not required
Beiersdorf	Eucerinum W/O ba...	83730208WA	34359	40	not required
Actavis	Abitima [®] clinic ...	170180	34360	40	not required

Validation samples

A total of 48 238 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 2700 spectra of 65 reference samples from the substance/substance group *Hydrophilic ointments*. These samples are listed above in the [calibration samples](#) section.
- 17978 spectra from a total of 426 batches from further 137 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 2170 spectra of 61 reference samples from the substance/substance group *Hydrophilic ointments*.

Supplier	Substance	Batch	Sample ID	Spectra
Actavis	Abitima [®] clinic body cream	072013	30736	40
Spirig Pharma	Excipial [®] hydro cream	I013	30836	40
Taoasis	Base cream Taoasis	121205-2276	31041 [†]	20
Spirig Pharma	Excipial [®] hydro cream	N013	31277	40
Dr. Wolff	Linola [®] body milk	433240	31511 [†]	20
Spirig Pharma	Lipoderm [®] lotion	R023	31535 [†]	20
Beiersdorf	Eucerinum O/W basis	41830108WA	31539 [†]	20
Taoasis	Base cream Taoasis	141222-4350	31578 [†]	20
Hans Karrer GmbH	Hans Karrer Lipolotion Micro...	15003	31730 [†]	20
Infectopharm	Neuroderm [®] moisturising cream	S101428.1	31761 [†]	20
Infectopharm	Neuroderm [®] care lotion	S031505.1	31772 [†]	20
Koko	DMS [®] base cream classic	L034H15	31869 [†]	20
Koko	DMS [®] base cream high classic	L041K15	31870 [†]	20
Hans Karrer GmbH	Hans Karrer Lipolotion Micro...	15008	31873 [†]	20
Dr. Wolff	Linola [®] body milk	511750	31874 [†]	20
Actavis	Abitima [®] clinic face cream	158584	32179	40
Chiesi	Asche Basis [®] lotion	53075A	32715	40
Sanofi aventis	Dermatop [®] base cream	5F057A	32717	40

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Supplier	Substance	Batch	Sample ID	Spectra
Actavis	Abitima [®] clinic face cream	158584	32723	40
Infectopharm	Neuroderm [®] care lotion	S111514.1	32740	40
Hans Karrer GmbH	Hans Karrer Lipolotion Micro...	16005	32753	40
Dr. Wolff	Linola [®] body milk	606430	32765	40
Koko	DMS [®] base cream classic	L003E16	32788	40
Koko	DMS [®] base cream high classic	L003H16	32789	40
Koko	DMS [®] base cream classic	L003E16	32826	40
Koko	DMS [®] base cream high classic...	L018D16	32827	40
Infectopharm	Neuroderm [®] moisturising cream	S051612.1	32905	40
Infectopharm	Neuroderm [®] moisturising cream	S051612.1	32906	40
Chiesi	Asche Basis [®] lotion	53075A	32926	40
Chiesi	Asche Basis [®] cream	63351A	32928	40
Taoasis	Base cream Taoasis	161124-6322	32944	40
Taoasis	Base cream Taoasis	161124-6322	32945	40
Actavis	Abitima [®] clinic face cream	158584	32998	40
Actavis	Abitima [®] clinic body cream	040116	32999	40
Hans Karrer GmbH	Hans Karrer Lipocream MicroS...	17001	33196	40
Hans Karrer GmbH	Hans Karrer Lipocream MicroS...	16002	33197	40
Spirig Pharma	Excipial [®] U Lipolotio	T122	33204	40
Spirig Pharma	Excipial [®] U10 Lipolotio	T072	33205	40
Beiersdorf	Eucerinum O/W basis	64030208WA	33212	40
Spirig Pharma	Lipoderm [®] lotion	V012	33248	40
Dr. Wolff	Linola [®] body milk	609202	33258	40
Galderma Laboratorium G...	Excipial [®] U Lipolotio	T122	33269	40
Infectopharm	Neuroderm [®] care lotion	S081610.1	33286	40
Jenapharm	Neribas [®] cream	YY01FX3	33289	40
Galderma Laboratorium G...	Excipial [®] U Lipolotio	V011	33298	40
Koko	DMS [®] base cream high classic	L037K16	33433	40
Koko	DMS [®] base cream high classic	L037K16	33434	40
Chiesi	Asche Basis [®] cream	63354A	33435	40
Beiersdorf	Eucerinum W/O basis	72630108WA	33629	40
Allergika	Allergika [®] Base cream	09/072022	33670	40
Actavis	Abitima [®] clinic body cream	040116	33791	40
Actavis	Abitima [®] clinic face cream	161464	33793 [†]	10
Beiersdorf	Eucerinum O/W basis	64030208WA	33850	40
Beiersdorf	Eucerinum W/O basis	72630108WA	33922	40
Jenapharm	Neribas [®] cream	YY01X64	33951	40
Sanofi aventis	Dermatop [®] base cream	7F069A	33966	40
Spirig Pharma	Excipial [®] U10 Lipolotio	50393	33980	40
Spirig Pharma	Excipial [®] hydro cream	50235	33982	40
Spirig Pharma	Lipoderm [®] lotion	V042	33985	40
Hans Karrer GmbH	Hans Karrer Lipolotion Micro...	18004	34118	40
Actavis	Abitima [®] clinic body cream	150818	34363	40

- 21 178 spectra from a total of 528 batches from further 182 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

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

- 996 spectra from 160 *Apo-Ident* customers from 530 batches from the substance/substance group *Hydrophilic ointments*.

Supplier	Substance	Batch	Spectra
Beiersdorf	Eucerinum W/O basis	21430108WA	2
Baiersdorf	Eucerinum W/O basis	24830208WA	1
Beiersdorf	Eucerinum W/O basis	24830208WA	1
BDF / Sanacorp	Eucerinum W/O basis	21430108WA	1
Beiersdorf/Sanacorp	Eucerinum W/O basis	31230108WA	1
Beiersdorf/Anzag	Eucerinum W/O basis	31230108WA	1
beiersdorf	Eucerinum W/O basis	31230108WA	1
beiersdorf	Eucerinum W/O basis	24830208WA	1
BDF	Eucerinum W/O basis	31230108WA	1
Beiersdorf	Eucerinum W/O basis	32930208WA	4
BeiersdorfPhoenix	Eucerinum W/O basis	31230108WA	1
Beiersdorf	Eucerinum W/O basis	31230108wa	1
Beiersdorf AG	Eucerinum W/O basis	32930208WA	3
Beiersdorf	Eucerinum W/O basis	31230108WA	1
Beiersdorf AG/Noweda	Eucerinum W/O basis	31230108WA	1
Gehe	Eucerinum W/O basis	32930208WA	1
Beiersdorf	Eucerinum W/O basis	34930308WA	5
Beiersdorf/Phoenix	Eucerinum W/O basis	34930308WA	1
Beiersdorf AG	Eucerinum W/O basis	34930308WA	1
Baiersdorf	Eucerinum W/O basis	41839108WA	1
eucerinum	Eucerinum W/O basis	41830108WA	1
Beiersdorf/Noweda	Eucerinum W/O basis	34930308WA	1
Beiersdorf	Eucerinum W/O basis	41830108WA	2
Beiersdorf AG	Eucerinum W/O basis	41830108WA	1
Beiersdorf/ Sanacorp	Eucerinum W/O basis	418301087WA	1
Beiersdorf/Noweda	Eucerinum W/O basis	41830108wa	1
Caelo	Eucerinum W/O basis	41830108WA	3
BDF	Eucerinum W/O basis	41830108WA	1
Beiersdorf/Noweda	Eucerinum W/O basis	41830108WA	1
Ph.Eur.8.0	Eucerinum W/O basis	41830108WA	1
Caelo	Eucerinum W/O basis	21430108WA	1
Baiersdorf	Eucerinum W/O basis	43430208WA	1
Beiersdor	Eucerinum W/O basis	541830108WA	1
Beiersdorf/Gehe	Eucerinum W/O basis	43430208WA	1
Gehe/Beiersdorf	Eucerinum W/O basis	51630108WA	1
BDF / Noweda	Eucerinum W/O basis	43430208WA	1
Beiersdorf	Eucerinum W/O basis	51630108WA	7
Beiersdorf/Noweda	Eucerinum W/O basis	51630108WA	4
Beiersdorf/Noweda	Eucerinum W/O basis	51630108wa	1
Caelo	Eucerinum W/O basis	51630108wa	1
Beiersdorf	Eucerinum W/O basis	24072015A	1
Noweda/BDF	Eucerinum W/O basis	51630108WA	1
Beiersdorf	Eucerinum W/O basis	516301328wa	1
Beiersdorf/ Vedono	Eucerinum W/O basis	34930308WA	1
Beiersdorf AG	Eucerinum W/O basis	51630108WA	2
Rondell Apotheke	Eucerinum W/O basis	51630108WA	1
Caelo	Eucerinum W/O basis	53430208WA	4
Beiersdorf	Eucerinum W/O basis	53430208WA	1
Caelo	Eucerinum W/O basis	51630108WA	1
Beiersdorf / Phönix	Eucerinum W/O basis	53430208WA	1
Beiersdorf/Noweda	Eucerinum W/O basis	53430208WA	4
Beiersdorf/Phönix	Eucerinum W/O basis	53430208WA	1
Caelo	Eucerinum W/O basis	51630108	1
Beiersdorf/Noweda	Eucerinum W/O basis	64030108WA	1
Caelo	Eucerinum W/O basis	64030108WA	2

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Supplier	Substance	Batch	Spectra
Beiersdorf	Eucerinum W/O basis	64030108WA	2
Allianz Healthcare	Eucerinum W/O basis	64030108wa	1
Beiersdorf/ Phoenix	Eucerinum W/O basis	64030108WA	1
Beiersdorf/Kehr	Eucerinum W/O basis	64030108WA	1
Noweda	Eucerinum W/O basis	72630108WA	4
Beiersdorf/Noweda	Eucerinum W/O basis	72630108VVA	1
Beiersdorf	Eucerinum W/O basis	72630108WA	3
Beiersdorf / Alliance h...	Eucerinum W/O basis	72630108WA	1
Beiersdorf/Noweda	Eucerinum W/O basis	72630108WA	1
Beiersdorf/Noweda	Eucerinum W/O basis	726300108WA	1
Beiersdorf / Phoenix	Eucerinum W/O basis	80330108WA	1
Beiersdorf/Noweda	Eucerinum W/O basis	80330108WA	1
Sanacorp/Beiersdorf	Eucerinum W/O basis	80330108WA	1
Beiersdorf/Alliance Hea...	Eucerinum W/O basis	72630108WA	1
Beiersdorf	Eucerinum W/O basis	80330108WA	1
Beiersdorf AG	Eucerinum O/W basis	2483030308WA	1
Beiersdorf	Eucerinum O/W basis	24830308WA	1
Beiersdorf AG	Eucerinum O/W basis	24830308WA	1
Beiersdorf	Eucerinum O/W basis	319030108WA	1
Caelo	Eucerinum O/W basis	13730308WA	1
Caelo	Eucerinum O/W basis	31930108WA	1
Beiersdorf/Gehe	Eucerinum O/W basis	31930108WA	1
Beiersdorf	Eucerinum O/W basis	51630108WA	1
Beiersdorf AG/Noweda	Eucerinum O/W basis	53430208WA	1
Beiersdorf	Eucerinum O/W basis	53430208WA	1
Beiersdorf/AHD	Eucerinum O/W basis	51630108WA	1
Beiersdorf/Kehr	Eucerinum O/W basis	53430208WA	3
Beiersdorf/Noweda	Eucerinum O/W basis	53430208WA	1
Beiersdorf/Kehr	Eucerinum O/W basis	61130108WA	1
Caelo	Eucerinum O/W basis	64030208WA	1
Beiersdorf/AHD	Eucerinum O/W basis	64030208WA	1
Beiersdorf/VDL	Eucerinum O/W basis	64030208WA	1
Beiersdorf	Eucerinum O/W basis	72630108WA	1
Beiersdorf/kehr	Eucerinum O/W basis	72630108WA	1
Beiersdorf/Gehe	Eucerinum O/W basis	80230108WA	1
Intendis GmbH	Neribas [®] cream	24089A	1
Chiesi / Gehe	Neribas [®] cream	32097A	1
Intendis / Gehe	Neribas [®] cream	21076A	1
Jenapharm / Gehe	Neribas [®] cream	34104C	1
Intendis / Sanacorp	Neribas [®] cream	24105A	1
Jenapharm/Alliance	Neribas [®] cream	YY000C3	1
Bayer/ Sanacorp	Neribas [®] cream	YY002L6	1
Jenapharm/Alliance	Neribas [®] cream	YY001HS	1
Jenapharm/Gehe	Neribas [®] cream	YY005HT	1
GPGrenzach Produktion/P...	Neribas [®] cream	YY01673	1
Jenapharm/Gehe	Neribas [®] cream	YY006KY	1
Phönix / Jenapharm	Neribas [®] cream	YY01FX3	1
Caelo	Neribas [®] cream	yyo18ff	1
Caelo	Neribas [®] cream	YY01X64	1
Spirig/Phoenix	Lipoderm [®] lotion	M065	4
Spirig Pharma AG/Allian...	Lipoderm [®] lotion	N041	1
Spirig Pharma AG	Lipoderm [®] lotion	N041	1
Spirig/AHD	Lipoderm [®] lotion	N041	1
Spirig/AHD	Lipoderm [®] lotion	LOTN041	1
Spirig	Lipoderm [®] lotion	R011	2
Spirig Pharma AG/Allian...	Lipoderm [®] lotion	N041	1
Spirig Pharma AG/Allian...	Lipoderm [®] lotion	R011	4
Spirig Pharma AG/Allian...	Lipoderm [®] lotion	R023	8
Spirig	Lipoderm [®] lotion	LOTR011	1
Spirig	Lipoderm [®] lotion	R023	2

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Supplier	Substance	Batch	Spectra
Spirig Pharma AG/Allian...	Lipoderm [®] lotion	R044	3
Galderma	Lipoderm [®] lotion	R044	2
Spirig/AllianceHC	Lipoderm [®] lotion	S021	3
Galderma/Kehr	Lipoderm [®] lotion	S021	2
Galderma	Lipoderm [®] lotion	S021	1
Galderma/Phoenix	Lipoderm [®] lotion	S041	1
Spirig	Lipoderm [®] lotion	S041	2
Galderma/AllianceHC	Lipoderm [®] lotion	T011	2
Jenne	Lipoderm [®] lotion	T011	1
Galderma	Lipoderm [®] lotion	T011	1
Spirig Pharma/Phoenix	Lipoderm [®] lotion	T043	2
Spirig Pharma	Lipoderm [®] lotion	V012	1
Chisi	Asche Basis [®] cream	23203A	1
Anzag	Asche Basis [®] cream	23204A	1
Chiesi	Asche Basis [®] cream	23204A	1
Chiesi/Phoenix	Asche Basis [®] cream	24215A	1
Chiesi/Anzag	Asche Basis [®] cream	24221A	1
Chiesi/Gehe	Asche Basis [®] cream	24221A	4
Chiesi/Gehe	Asche Basis [®] cream	24218A	1
chiesi / Noweda	Asche Basis [®] cream	23213A	1
Chiesi	Asche Basis [®] cream	24214A	2
Chiesi	Asche Basis [®] cream	24219A	1
Chiesi	Asche Basis [®] cream	24220A	2
Ichthyol/Sanacorp	Asche Basis [®] cream	24221A	1
Chiesi/AHD	Asche Basis [®] cream	31222A	1
Chiesi GmbH	Asche Basis [®] cream	24214A	1
Chiesi/AHD	Asche Basis [®] cream	31223A	1
Chiesi	Asche Basis [®] cream	23206A	1
Chiesi GmbH / Anzag	Asche Basis [®] cream	22196A	1
chiesi / Noweda	Asche Basis [®] cream	31222A	1
Chiesi/Ebert	Asche Basis [®] cream	31224A	1
Chiesi GmbH / Anzag	Asche Basis [®] cream	31222A	1
Chiesi/Phoenix	Asche Basis [®] cream	31227A	2
Caelo	Asche Basis [®] cream	31226A	1
chiesi /Jenne	Asche Basis [®] cream	31227a	1
Chiesi/Phoenix	Asche Basis [®] cream	31225A	1
Chiesi/AHD	Asche Basis [®] cream	31224A	1
Caelo	Asche Basis [®] cream	31227A	1
Chiesi GmbH / Anzag	Asche Basis [®] cream	31230A	1
Chiesi/Noweda	Asche Basis [®] cream	31224A	1
Chiesi/Gehe	Asche Basis [®] cream	31224A	1
All.Heal./Chiesi	Asche Basis [®] cream	24218A	1
Chiesi GmbH / Anzag	Asche Basis [®] cream	31229A	1
Chiesi/Sanacorp	Asche Basis [®] cream	31227A	1
Chiesi/AHD	Asche Basis [®] cream	31228A	2
chiesi / Noweda	Asche Basis [®] cream	31225A	1
chiesi/gehe	Asche Basis [®] cream	32236A	1
chiesi/gehe	Asche Basis [®] cream	31228A	1
Chiesi/Noweda	Asche Basis [®] cream	31229A	1
Chiesi	Asche Basis [®] cream	14178A	1
Phönix	Asche Basis [®] cream	322344	1
Chiesi	Asche Basis [®] cream	31227A	2
Chiesi/AHD	Asche Basis [®] cream	32234A	1
Chiesi GmbH / Anzag	Asche Basis [®] cream	31231A	2
Chiesi	Asche Basis [®] cream	32236A	1
Chiesi/Phoenix	Asche Basis [®] cream	31229A	1
Chiesi/Gehe	Asche Basis [®] cream	32233A	1
Chiesi	Asche Basis [®] cream	32235A	1
Chiesi	Asche Basis [®] cream	31232A	1
Chiesi	Asche Basis [®] cream	32233A	4

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Supplier	Substance	Batch	Spectra
Gehe/Chiesi	Asche Basis [®] cream	32233A	1
Chiesi/Noweda	Asche Basis [®] cream	31232A	1
Chiesi/AHD	Asche Basis [®] cream	32235A	1
Chiesi/Phoenix	Asche Basis [®] cream	32233A	1
Chiese	Asche Basis [®] cream	24221A	1
Chiesi/ phoenix	Asche Basis [®] cream	33239A	1
Euro OTC	Asche Basis [®] cream	3229A	1
Gehe	Asche Basis [®] cream	32236A	1
Chiesi/AHD	Asche Basis [®] cream	33238A	1
Chiesi	Asche Basis [®] cream	24217A	1
Chiesi/AHD	Asche Basis [®] cream	33242A	1
Phoenix/Chiesi	Asche Basis [®] cream	33246A	1
Chiesi	Asche Basis [®] cream	33237A	1
Alliance Healthcare	Asche Basis [®] cream	33237A	1
Alliance Healthcare	Asche Basis [®] cream	33240A	1
Chiesi/ Now	Asche Basis [®] cream	33240A	1
Chiesi/Noweda	Asche Basis [®] cream	33237A	1
Chiesi	Asche Basis [®] cream	33240A	1
Chiesi / Noweda	Asche Basis [®] cream	33238A	1
Chiesi / Gehe	Asche Basis [®] cream	33244A	1
Lamotte / Gehe	Asche Basis [®] cream	34247A	1
Gehe	Asche Basis [®] cream	33244A	1
chiesi/gehe	Asche Basis [®] cream	33246A	2
Chiesi GmbH / Anzag	Asche Basis [®] cream	33244A	1
Chiesi	Asche Basis [®] cream	33243A	1
Chiesi/AHD	Asche Basis [®] cream	34247A	1
Chiesi / Noweda	Asche Basis [®] cream	33246A	1
Chiesi/Noweda	Asche Basis [®] cream	34247A	1
Chiesi	Asche Basis [®] cream	34249A	1
Chiesi/Gehe	Asche Basis [®] cream	34248A	1
Chiesi	Asche Basis [®] cream	34251A	3
Chiesi GmbH / Sanacorp	Asche Basis [®] cream	34247A	1
Chiesi	Asche Basis [®] cream	34250A	1
Chiesi/V.d.L.	Asche Basis [®] cream	34250A	1
Chiesi	Asche Basis [®] cream	34248A	1
Chiesi/Gehe	Asche Basis [®] cream	34253A	1
Chiesi GmbH / Anzag	Asche Basis [®] cream	34249A	1
chiesi / Noweda	Asche Basis [®] cream	34250A	1
Chiesi	Asche Basis [®] cream	33239A	2
Chiese	Asche Basis [®] cream	41259A	1
Chiesi	Asche Basis [®] cream	41258A	2
Chiesi / Gehe	Asche Basis [®] cream	34252A	1
Chiesi/ Now	Asche Basis [®] cream	41259A	1
Chiesi	Asche Basis [®] cream	41261A	1
Chiesi/Noweda	Asche Basis [®] cream	41258A	1
Chiesi GmbH / Anzag	Asche Basis [®] cream	41260A	1
Chiesi GmbH / Anzag	Asche Basis [®] cream	41261A	1
Chiesi	Asche Basis [®] cream	41260A	2
Chiesi	Asche Basis [®] cream	42270A	1
CHiesi	Asche Basis [®] cream	41264A	1
Chiesi GmbH / Anzag	Asche Basis [®] cream	42268A	2
Chiesi / Gehe	Asche Basis [®] cream	41265A	1
Chiesi/Gehe	Asche Basis [®] cream	41260A	1
Chiesi/Gehe	Asche Basis [®] cream	41262A	1
Chiesi/	Asche Basis [®] cream	41266A	1
Chiesi	Asche Basis [®] cream	30102014A	1
Anzag/ Chiesi	Asche Basis [®] cream	42269A	1
Chiesi	Asche Basis [®] cream	42272A	1
Anzag/ Chiesi GmbH	Asche Basis [®] cream	42272A	1
Anzag/ Chiesi GmbH	Asche Basis [®] cream	42273A	1

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Supplier	Substance	Batch	Spectra
Chiesi/ Now	Asche Basis [®] cream	42273A	1
Chiesi	Asche Basis [®] cream	42271A	2
Chiesi/Noweda	Asche Basis [®] cream	42275A	1
Caelo	Asche Basis [®] cream	41265B	1
Chiesi / Gehe	Asche Basis [®] cream	43281A	1
Chiesi/Gehe	Asche Basis [®] cream	42271A	1
Chiesi	Asche Basis [®] cream	43280A	1
Chiesi/Noweda	Asche Basis [®] cream	43280A	1
Chiesi	Asche Basis [®] cream	42275A	1
Chiesi	Asche Basis [®] cream	43278A	1
Chiesi/Phoenix	Asche Basis [®] cream	43278A	1
Chiesi	Asche Basis [®] cream	43279A	1
Chiesi	Asche Basis [®] cream	43287A	1
Chiesi/ Now	Asche Basis [®] cream	43283A	2
Chiesi/ Now	Asche Basis [®] cream	43282A	1
Chiesi/Noweda	Asche Basis [®] cream	44288A	1
Chiesi/Alliance Healthc. ...	Asche Basis [®] cream	44290A	4
Chiesi / Gehe	Asche Basis [®] cream	51292A	1
Chiesi / Gehe	Asche Basis [®] cream	42273A	1
Chiesi	Asche Basis [®] cream	51300A	4
Chiesi/ Noweda	Asche Basis [®] cream	51294a	1
Chiesi	Asche Basis [®] cream	51294A	1
Chiesi	Asche Basis [®] cream	51296A	2
Chiesi / Phoenix	Asche Basis [®] cream	51300A	1
Chiesi/Gehe	Asche Basis [®] cream	51301A	1
Gehe/Chiesi	Asche Basis [®] cream	51296A	1
Chiesi	Asche Basis [®] cream	51305A	2
Caelo	Asche Basis [®] cream	52306A	3
noweda/chiesi	Asche Basis [®] cream	52306A	1
Chiesi	Asche Basis [®] cream	52307A	2
Chiesi/Sanacorp	Asche Basis [®] cream	51305A	3
Caelo	Asche Basis [®] cream	52323a	1
Chiesi/Gehe	Asche Basis [®] cream	52307A	1
Chiesi / Gehe	Asche Basis [®] cream	52314A	1
Chiesi / Phoenix	Asche Basis [®] cream	52323A	2
Chiesi/Alliance Healthc. ...	Asche Basis [®] cream	52323A	4
Gehe-Chiesi	Asche Basis [®] cream	52308A	1
Chiesi	Asche Basis [®] cream	52308A	3
Chiesi GmbH	Asche Basis [®] cream	52319A	1
Chiesi/Sanacorp WE:06.0...	Asche Basis [®] cream	52317A	1
Chiesi/Alliance Healthc. ...	Asche Basis [®] cream	53329A	1
Chiesi,Fa.Gehe	Asche Basis [®] cream		1
Chiesi/Noweda	Asche Basis [®] cream	52318A	1
Chiesi/Noweda	Asche Basis [®] cream	52318a	1
Chiesi/Noweda	Asche Basis [®] cream	53329A	1
Gehe/Chesie	Asche Basis [®] cream	52318A	2
Chiesi	Asche Basis [®] cream	52309A	1
Caelo	Asche Basis [®] cream	52322A	3
Chiesi	Asche Basis [®] cream	52322A	1
Chiesi,Gehe	Asche Basis [®] cream		1
Chiesi	Asche Basis [®] cream	53331A	2
Phoenix	Asche Basis [®] cream	53331A	1
Chiesi/Phönix WE:27.05....	Asche Basis [®] cream	52309A	1
Chiesi/Phönix	Asche Basis [®] cream	53329A	1
Caelo	Asche Basis [®] cream	53331A	1
Chiesi / Phoenix WE: 06...	Asche Basis [®] cream	53325A	1
Chiesi	Asche Basis [®] cream	53330A	1
Chiesi/ Noweda	Asche Basis [®] cream	52307A	1
Fa.Gehe	Asche Basis [®] cream	20160727Ma4	1
Caelo	Asche Basis [®] cream	53330A	1

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Supplier	Substance	Batch	Spectra
Chiesi GmbH	Asche Basis [®] cream	61335A	1
Phoenix	Asche Basis [®] cream	54332A	1
Chiesi/Anzag	Asche Basis [®] cream	53327A	1
Chiesi	Asche Basis [®] cream	53329A	1
WE:Phönix28.07.2016 E...	Asche Basis [®] cream	61336A	1
Chiesi	Asche Basis [®] cream	54332A	1
Euro OTC	Asche Basis [®] cream	61337A	2
Caelo	Asche Basis [®] cream	61338A	1
Caelo	Asche Basis [®] cream	61341A	2
WE: Phoenix 07.10.2016 ...	Asche Basis [®] cream	61340A	1
WE: Phoenix 23.09.2016 ...	Asche Basis [®] cream	61339A	1
Chiesi	Asche Basis [®] cream	62343A	2
Chiesi GmbH/Gehe	Asche Basis [®] cream		2
WE Sanacorp	Asche Basis [®] cream	61341A	1
Chiesi	Asche Basis [®] cream	63347A	3
PHÖNIX	Asche Basis [®] cream	62343A	1
Chiesi	Asche Basis [®] cream	63354A	1
PhönixWE:3.02.2017 EK...	Asche Basis [®] cream	63350A	1
Chiesi/Gehe	Asche Basis [®] cream	63350A	1
Chiesi//Phönix	Asche Basis [®] cream	63354A	1
Sanacorp WE 20.02.17 -7...	Asche Basis [®] cream	63351A	3
Phoenix/Chiesi	Asche Basis [®] cream	61333A	1
Chiesi	Asche Basis [®] cream	63350A	1
Fagron	Asche Basis [®] cream	63353A	1
Chiesi	Asche Basis [®] cream	63355A	1
Chiesi	Asche Basis [®] cream	64357A	3
Chiesi/ Noweda	Asche Basis [®] cream	170420AB/63353A	1
Phoenix/Chiesi	Asche Basis [®] cream	64358A	1
Chiesi/Noweda	Asche Basis [®] cream	170421AB/63353A	1
Dr. Wolff	Asche Basis [®] cream		1
Gehe	Asche Basis [®] cream	64358A	2
Chiesi	Asche Basis [®] cream	64360A	2
Phoenix WE 13.04.17 -7,...	Asche Basis [®] cream	63353A	2
Chiesi/Phönix WE:19.05...	Asche Basis [®] cream	64357A	1
Chiesi/ Noweda	Asche Basis [®] cream	170601ABC/64357A	1
Chiesi/ Noweda	Asche Basis [®] cream	170628ABC/64362A	1
Chiesi/Phönix WE:20.06...	Asche Basis [®] cream	64362A	2
Chiesi/ Noweda	Asche Basis [®] cream	170706ABC/64361A	1
Chiesi	Asche Basis [®] cream	64362A-20170704Ma4	1
Sanacorp EK:8,07 EUR...	Asche Basis [®] cream	64363A	1
Sanacorp EK:8,07 EUR...	Asche Basis [®] cream	64364A	1
Chiesi/ Noweda	Asche Basis [®] cream	170816AB/64364A	1
Chiesi/ Noweda	Asche Basis [®] cream	170927AB/71370A	1
Caelo	Asche Basis [®] cream	64364A	1
Caelo	Asche Basis [®] cream	20170829Ma4	1
phönix WE: 28.08.17 EK...	Asche Basis [®] cream	64365A	2
Chiesi/ Noweda	Asche Basis [®] cream	171025AB/71371A	1
Chiesi/Phoenix	Asche Basis [®] cream	71368A	1
Wolff/Gehe	Asche Basis [®] cream	64365A-20171106Ma10	1
Chiesi/ Noweda	Asche Basis [®] cream	71371A	1
Wolff/Gehe	Asche Basis [®] cream	71366A	1
Chiesi	Asche Basis [®] cream	71370A	1
chiesi-	Asche Basis [®] cream	71372A20171127Ma13	1
Chiesi/Noweda	Asche Basis [®] cream	171211AB/72376A	1
Phoenix WE: 08.11.17 10...	Asche Basis [®] cream	71372A	1
Phoenix WE: 09.10.17 50...	Asche Basis [®] cream	71368A	1
Chiesi/ Noweda	Asche Basis [®] cream	171215ABC/72376A	1
Gehe	Asche Basis [®] cream	64360A	1
Caelo	Asche Basis [®] cream	71372A	1
Chiesi/Gehe	Asche Basis [®] cream	71371A	1

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Supplier	Substance	Batch	Spectra
Chiesi/Phoenix	Asche Basis [®] cream	72377A	1
Chiesi/ Noweda	Asche Basis [®] cream	171228ABC/72376A	1
Chiesi/Noweda	Asche Basis [®] cream	180112ABC/72378A	1
Chiesi-Fa.Gehe	Asche Basis [®] cream	71372A	1
chiesi	Asche Basis [®] cream	71374A	1
Chiesi	Asche Basis [®] cream	72378A	1
Sanacorp W.E: 02.02.18 ...	Asche Basis [®] cream	72377A	1
Chiesi/Phönix	Asche Basis [®] cream	72385A	1
Chiesi/ Noweda	Asche Basis [®] cream	180219AB/72379A	1
Caelo	Asche Basis [®] cream	73386A	1
chiesi gmbh	Asche Basis [®] cream	72380A	1
Chiesi GmbH	Asche Basis [®] cream	72379A	1
Insel	Asche Basis [®] cream	72378A	1
Chiesi/Gehe	Asche Basis [®] cream	72379A	1
Sanacoro W.E:01.03.18 ...	Asche Basis [®] cream	72379A	2
Sanacoro W.E:01.03.18 ...	Asche Basis [®] cream	72378A	1
Sanacorp /100ml	Asche Basis [®] cream	72382A	2
Chiesi/Noweda	Asche Basis [®] cream	180322AB/72382A	1
Chiesi/Gehe	Asche Basis [®] cream	72381A	2
Chiesi/Phoenix	Asche Basis [®] cream	72383A	1
Chiesi/ Noweda	Asche Basis [®] cream	73389A	1
Caelo	Asche Basis [®] cream	74391A	1
Chiesi/Gehe	Asche Basis [®] cream	74390A	1
Chiesi/Gehe	Asche Basis [®] cream	73388A	1
Chiesi/Noweda	Asche Basis [®] cream	74394A	1
Chiesi	Asche Basis [®] cream	74390A	1
Chiesi/Insel	Asche Basis [®] cream	74391A	1
Chiesi GmbH / Anzag	Asche Basis [®] cream	74394A	1
Chiesi-Fa.Gehe 19.6.18	Asche Basis [®] cream	74391A-20180830Ma7	1
chiesi-	Asche Basis [®] cream	72376A-20180830Ma8	1
Chiesi	Asche Basis [®] cream	74392A	1
Chiesi/Phoenix	Asche Basis [®] cream	74394A	1
Hedinger	Asche Basis [®] cream	74398A	1
Chiese / Gehe	Asche Basis [®] cream	74392A	1
Chiesi-Fa.Gehe	Asche Basis [®] cream	81401A-A20190115Ma11	1
Chiesi	Asche Basis [®] cream	81401A	1
Chiesi GmbH	Asche Basis [®] cream	81402A	1
chiesi gmbh	Asche Basis [®] cream	82410A	1
Sanacorp	Neuroderm [®] moisturising cream		1
infectopharm	Neuroderm [®] moisturising cream		1
Infectopharm	Neuroderm [®] moisturising cream		6
Bombastus	Neuroderm [®] moisturising cream		1
Noweda	Neuroderm [®] moisturising cream		1
Infectopharm/Kehr	Neuroderm [®] moisturising cream		1
Infectopharm/Gehe	Neuroderm [®] moisturising cream	S0315081	1
Infectopharm/Fiebig	Neuroderm [®] moisturising cream		1
Infectopharm/Phönix	Neuroderm [®] moisturising cream		4
Caelo	Neuroderm [®] moisturising cream		1
Spirig	Excipial [®] hydro cream	K013	1
spirig	Excipial [®] hydro cream	M014	2
Spirig/Gehe	Excipial [®] hydro cream	M012	1
Spirig/Anzag	Excipial [®] hydro cream	L0TM041	1
Spirig Pharma	Excipial [®] hydro cream	N013	1
spirig	Excipial [®] hydro cream	M041	1
spirig	Excipial [®] hydro cream	M034	1
Spirig / Anzag	Excipial [®] hydro cream	813993/09	1
Spirig Pharma	Excipial [®] hydro cream	813993/10	1
spirig	Excipial [®] hydro cream	813993/10	1
Spirig Pharma	Excipial [®] hydro cream	N011	1
Spirig / Anzag	Excipial [®] hydro cream	813993/10	1

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Supplier	Substance	Batch	Spectra
Sanacorp	Excipial [®] hydro cream	L0TN011	1
Spirig / Anzag	Excipial [®] hydro cream	N034	1
Spirig Pharma	Excipial [®] hydro cream	L0N014	1
Phoenix/Spirig	Excipial [®] hydro cream	M015	1
Sanacorp	Excipial [®] hydro cream	N011	1
Spirig	Excipial [®] hydro cream	N035	1
Phönix/Spirig	Excipial [®] hydro cream	N034	1
Spirig/Anzag	Excipial [®] hydro cream	N035	1
Alliance/Spirig	Excipial [®] hydro cream	N043	1
spirig	Excipial [®] hydro cream	N034	2
Spirig Pharma	Excipial [®] hydro cream	N044	1
Spirig / Gehe	Excipial [®] hydro cream	N011	1
Phoenix/Spirig	Excipial [®] hydro cream	N044	1
spirig	Excipial [®] hydro cream	No14	1
Spirig Pharma AG/ Anzag	Excipial [®] hydro cream	L0TN034	1
spirig	Excipial [®] hydro cream	N043	2
Spirig / Gehe	Excipial [®] hydro cream	L0TN044	1
Spirig / Anzag	Excipial [®] hydro cream	L0TN043	1
spirig	Excipial [®] hydro cream	R013	2
Spirig/Noweda	Excipial [®] hydro cream	N043	1
Spirig	Excipial [®] hydro cream	N043	1
Spirig	Excipial [®] hydro cream	R013	1
Spirig Pharma AG/ Anzag	Excipial [®] hydro cream	L0TR013	1
Spirig Pharma AG/GEHE	Excipial [®] hydro cream	R011	1
Spirig / Noweda	Excipial [®] hydro cream	N035	1
spirig	Excipial [®] hydro cream	N045	2
Spirig Pharma/Gehe	Excipial [®] hydro cream		1
spirig	Excipial [®] hydro cream	R014	2
AHD	Excipial [®] hydro cream	R011	1
Caelo	Excipial [®] hydro cream	R045	1
Spirig/Gehe	Excipial [®] hydro cream	R014	1
Spirig	Excipial [®] hydro cream	S025	6
Spirig Pharma AG	Excipial [®] hydro cream	813993/12	1
Galderma/Galderma	Excipial [®] hydro cream	S024	2
Spirig/Fiebig	Excipial [®] hydro cream	N013	1
Galderma/Galderma	Excipial [®] hydro cream	so25	1
Galderma/Alliance Healt...	Excipial [®] hydro cream	S025	1
Spirig/Gehe	Excipial [®] hydro cream	L0TR031	2
Galderma/ Sana	Excipial [®] hydro cream	S025	1
Galderma/ Sana	Excipial [®] hydro cream	S024	1
spirig	Excipial [®] hydro cream	s025	1
Galderma/Gehe	Excipial [®] hydro cream	R031	1
Spirig Pharma/ G	Excipial [®] hydro cream	S053	1
Galderma	Excipial [®] hydro cream	S054	1
Galderma/Noweda	Excipial [®] hydro cream	S054	2
Gehe, Galderma Spirig	Excipial [®] hydro cream	R031-20160615Ma7	1
Galderma/Galderma	Excipial [®] hydro cream	S054	1
Fa. Gehe	Excipial [®] hydro cream	20160727Ma3	1
Galderma/Phönix	Excipial [®] hydro cream	S045	1
Spirig (Galderma)	Excipial [®] hydro cream	T012	2
Jenne	Excipial [®] hydro cream	S041	1
Spirig (Galderma)	Excipial [®] hydro cream	T011	1
Spirig/Gehe	Excipial [®] hydro cream		3
Noweda/Galderma	Excipial [®] hydro cream	T091	2
Phoenix/Galderma	Excipial [®] hydro cream	T012	1
Spirig (Galderma)	Excipial [®] hydro cream	V011	2
Galderma/Noweda	Excipial [®] hydro cream	170420EH/L0TT012	1
Noweda	Excipial [®] hydro cream	1120114	1
Galderma/Noweda	Excipial [®] hydro cream	170706EH/L0TT091	1
Galderma/Ebert	Excipial [®] hydro cream	V041	1

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Supplier	Substance	Batch	Spectra
Galderma/Noweda	Excipial [®] hydro cream	V042	1
Galderma/Gehe	Excipial [®] hydro cream	V042	1
Galderma-Spirig	Excipial [®] hydro cream	To52-20171127Ma11	1
Noweda	Excipial [®] hydro cream	V051	1
Galderma/Noweda	Excipial [®] hydro cream	180319EH/LOTV051	1
Galderma/ Gehe	Excipial [®] hydro cream	V051	1
Galderma/Phoenix	Excipial [®] hydro cream	V031	1
Galderma/Gehe	Excipial [®] hydro cream	V071	1
Caelo	Excipial [®] hydro cream	V071	2
Chiesi/Phoenix	Excipial [®] hydro cream	LOTV071	1
Galderma/Phönic	Excipial [®] hydro cream	V061	1
Galderma-Spirig	Excipial [®] hydro cream	V041-20180619Ma8	1
Galderma	Excipial [®] hydro cream	LOTV071	1
Galderma/Gehe	Excipial [®] hydro cream	V072	2
Galderma	Excipial [®] hydro cream	V051	1
Gladerma/Ebert	Excipial [®] hydro cream	V072	1
Galderma-Spirig,Gehe 14. ...	Excipial [®] hydro cream	V061-20180830Ma11	1
Galderma-Spirig	Excipial [®] hydro cream	50235-E20190115Ma10	1
Galderma/Phönix	Excipial [®] hydro cream	50235	1
Spirig/Gehe	Excipial [®] U Lipolotio	M102	2
Spirig	Excipial [®] U Lipolotio	M091	1
Spirig/AHD	Excipial [®] U Lipolotio	M085	1
Spirig/Gehe	Excipial [®] U Lipolotio	M146	1
Spirig/Gehe	Excipial [®] U Lipolotio	M182	1
Spirig Pharma	Excipial [®] U Lipolotio	LOTK131	1
spirig	Excipial [®] U Lipolotio	M142	1
Spirig / Anzag	Excipial [®] U Lipolotio	M182	1
spirig	Excipial [®] U Lipolotio	N013	1
Spirig / Anzag	Excipial [®] U Lipolotio	N032	1
Spirig Pharma	Excipial [®] U Lipolotio	LOTN013	1
Phoenix/Spirig	Excipial [®] U Lipolotio	N041	1
spirig	Excipial [®] U Lipolotio	N061	1
spirig	Excipial [®] U Lipolotio	N058	3
Spirig / Anzag	Excipial [®] U Lipolotio	N041	1
Spirig Pharma	Excipial [®] U Lipolotio	M134	1
Spirig/AHD	Excipial [®] U Lipolotio	N058	1
spirig	Excipial [®] U Lipolotio	N086	1
Spirig/AHD	Excipial [®] U Lipolotio	lotno86	1
Fischar	Excipial [®] U Lipolotio	LOTN085	1
Phoenix	Excipial [®] U Lipolotio	N105	1
Spirig	Excipial [®] U Lipolotio	N086	1
Spirig / Sanacorp	Excipial [®] U Lipolotio	R041	1
Spirig	Excipial [®] U Lipolotio	N123	1
Spirig/Noweda	Excipial [®] U Lipolotio	N061	1
spirig	Excipial [®] U Lipolotio	R037	1
Galderma / Galderma	Excipial [®] U Lipolotio	R086	1
Fagron	Excipial [®] U Lipolotio	N168	2
Galderma	Excipial [®] U Lipolotio	R111	1
Galaderma	Excipial [®] U Lipolotio	R072	1
Spirig/Galderma	Excipial [®] U Lipolotio	R156	2
Spirig/Galderma	Excipial [®] U Lipolotio	R146	1
Galderma	Excipial [®] U Lipolotio	R167	2
Gehe-Spring	Excipial [®] U Lipolotio	LOTR167	1
Galderma (Spirig Pharma...	Excipial [®] U Lipolotio	R061	1
Galderma/Spirig Pharma AG	Excipial [®] U Lipolotio	LOTR187	1
Galderma/Galderma	Excipial [®] U Lipolotio	s017	1
Galderma	Excipial [®] U Lipolotio	R168	1
Spirig	Excipial [®] U Lipolotio	R047	1
Galderma / Kehr	Excipial [®] U Lipolotio	R167	1
Galderma / Kehr	Excipial [®] U Lipolotio	R171	1

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Supplier	Substance	Batch	Spectra
Galderma/Gehe	Excipial [®] U Lipolotio	R189	1
Galderma	Excipial [®] U Lipolotio	S064	1
Galderma, Sanacorp	Excipial [®] U Lipolotio	L0TS042	1
Galderma/Kehr	Excipial [®] U Lipolotio	S071	1
Noweda	Excipial [®] U Lipolotio	R261	1
Galderma	Excipial [®] U Lipolotio	S091	1
Spirig/Gehe	Excipial [®] U Lipolotio	R262	1
Phoenix	Excipial [®] U Lipolotio	S091	1
Caelo	Excipial [®] U Lipolotio	R186	1
Galderma/Anzag	Excipial [®] U Lipolotio	S206	1
Sprig (Galderma)/ G	Excipial [®] U Lipolotio	S123	1
Galderma	Excipial [®] U Lipolotio	R171	1
Galderma/Galderma	Excipial [®] U Lipolotio	S017	1
Phoenix	Excipial [®] U Lipolotio	S138	2
Galderma/Galderma	Excipial [®] U Lipolotio	S142	1
Galderma	Excipial [®] U Lipolotio	R172	1
Galderma/Kehr	Excipial [®] U Lipolotio	S203	1
Kehr/Galderma	Excipial [®] U Lipolotio	T029	1
Spirig Pharma	Excipial [®] U Lipolotio	S122	1
Galderma / Kehr	Excipial [®] U Lipolotio	T029	2
Galderma	Excipial [®] U Lipolotio	S147	1
Phoenix	Excipial [®] U Lipolotio	S148	1
Caelo	Excipial [®] U Lipolotio	L0TS081	1
galderma/G	Excipial [®] U Lipolotio	L0TS202	1
Gehe	Excipial [®] U Lipolotio	S132	1
Gehe	Excipial [®] U Lipolotio	S143	1
Caelo	Excipial [®] U Lipolotio	S206	1
Galderma (Spirig Pharma...	Excipial [®] U Lipolotio	T057	1
PHÖNIX	Excipial [®] U Lipolotio	T063	1
Phoenix WE 16.01.17 EK...	Excipial [®] U Lipolotio	L0TS122	2
Galderma/Phoenix	Excipial [®] U Lipolotio	L0TT085	1
Galderma/Noweda	Excipial [®] U Lipolotio	170420EUL/L0TS204	1
Galderma / Kehr	Excipial [®] U Lipolotio	T156	2
Spirig/Fiebig	Excipial [®] U Lipolotio	S143	1
Galderma/Noweda	Excipial [®] U Lipolotio	170518EUL/L0TT073	1
Galderma / Noweda	Excipial [®] U Lipolotio	T073/170522EUL	1
Galderma/Alliance Healt...	Excipial [®] U Lipolotio	T121	1
Galderma/Noweda	Excipial [®] U Lipolotio	170316EL/L0TT073	1
Galderma/Noweda	Excipial [®] U Lipolotio	V011	1
Galderma/ Alliance	Excipial [®] U Lipolotio	T115	1
Spirig	Excipial [®] U Lipolotio	L0TT057	1
Galderma/Phoenix	Excipial [®] U Lipolotio	3717E-03749	1
Galderma/Noweda	Excipial [®] U Lipolotio	170906EL/T072	1
Galderma/Noweda	Excipial [®] U Lipolotio	V041	1
Spirig/Kehr	Excipial [®] U Lipolotio	V038	1
Spirig Pharma	Excipial [®] U Lipolotio	V082	1
Galderma/Gehe	Excipial [®] U Lipolotio	T156	2
Galderma/Phoenix	Excipial [®] U Lipolotio	V041	1
Euro/ Phönix	Excipial [®] U Lipolotio	4417A-03749	1
Spirig Pharma	Excipial [®] U Lipolotio	V053	1
Galderma	Excipial [®] U Lipolotio	L0TV121	1
Galderma/Phoenix	Excipial [®] U Lipolotio	V061	1
Spirig Pharma	Excipial [®] U Lipolotio	V141	2
Caelo	Excipial [®] U Lipolotio	V101	1
Gehe/Galderma	Excipial [®] U Lipolotio	LotV011	1
Galderma	Excipial [®] U Lipolotio	V153	2
Galderma	Excipial [®] U Lipolotio	V053	1
Galderma/Phoenix	Excipial [®] U Lipolotio	V011	1
Galderma	Excipial [®] U Lipolotio	V159	1
Caelo	Excipial [®] U Lipolotio	LotV137	1

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Supplier	Substance	Batch	Spectra
Galderma/ Noweda	Excipial [®] U Lipolotio	L0T50450	1
Caelo	Excipial [®] U Lipolotio	LoTV143	1
Gehe	Excipial [®] U Lipolotio	V121	1
Caelo	Excipial [®] U Lipolotio	V143	1
Galderma/Gehe	Excipial [®] U Lipolotio	L0T50450	1
Galderma/Phoenix	Excipial [®] U Lipolotio	50450	1
Galderma/Gehe	Excipial [®] U Lipolotio	50450	1
Galderma	Excipial [®] U Lipolotio	50346	1
Fagron	Excipial [®] U Lipolotio	V081	1
Galderma/Gehe	Excipial [®] U Lipolotio	50691	1
Galderma	Excipial [®] U Lipolotio	270918A	1
Galderma /AHD	Excipial [®] U Lipolotio	169853	1
Spirig	Excipial [®] U Lipolotio	169838	1
Spirig	Excipial [®] U Lipolotio	50450	1
Spirig/AHD	Excipial [®] U10 Lipolotio	M025	1
Abitima	Abitima [®] clinic body cream	52015/051112	1
Roche/AHD	Abitima [®] clinic body cream	142620	1
Sanacorp	Abitima [®] clinic body cream	210612	1
Actavis/Gehe	Abitima [®] clinic body cream	51112	1
Sanacorp	Abitima [®] clinic body cream	70512	1
actavis	Abitima [®] clinic body cream	20912	2
Actavis	Abitima [®] clinic body cream	20912	1
Sanacorp	Abitima [®] clinic body cream	51112	1
Sanacorp	Abitima [®] clinic body cream	12015/110/12	1
Actavis/ Gehe	Abitima [®] clinic body cream	60513	1
Sanacorp	Abitima [®] clinic body cream	140113	1
Actavis/Sanacorp	Abitima [®] clinic body cream	110712	1
actavis/Gehe	Abitima [®] clinic body cream	112015	1
Actavis / Gehe	Abitima [®] clinic body cream	110712	1
actavis/Gehe	Abitima [®] clinic body cream	110712	2
actavis	Abitima [®] clinic body cream	60513	2
actavis/ebert	Abitima [®] clinic body cream	110712	1
actavis/Gehe	Abitima [®] clinic body cream	60513	1
Astellas Pharma	Abitima [®] clinic body cream	190213	1
Actavis Deutschland GmbH	Abitima [®] clinic body cream	350313	2
actavis	Abitima [®] clinic body cream	140113	1
actavis	Abitima [®] clinic body cream	70513	1
A.H.D.	Abitima [®] clinic body cream	260515	2
Actavis/Gehe	Abitima [®] clinic body cream	81013	1
Actavis	Abitima [®] clinic body cream	31114	2
Actavis Deutschland GmbH	Abitima [®] clinic body cream	31015	1
Actavis	Abitima [®] clinic body cream	10915	4
Actavis Group PTC	Abitima [®] clinic body cream	260515	1
Actavis	Abitima [®] clinic body cream	31015	2
Actavis/Noweda	Abitima [®] clinic body cream	21015	1
Actavis Deutschland GmbH	Abitima [®] clinic body cream	121115	1
GEHE	Abitima [®] clinic body cream	100116	2
Actavis	Abitima [®] clinic body cream	32018	1
GEHE	Abitima [®] clinic body cream	331017	2
Caelo	Abitima [®] clinic body cream	40116	1
Puren Pharma/Noweda	Abitima [®] clinic body cream	90118	1
Chiesi/AHD	Asche Basis [®] lotion	24049A	1
Chiesi/Anzag	Asche Basis [®] lotion	32054A	1
Chiesi/Gehe	Asche Basis [®] lotion	23047A	1
Caelo	Asche Basis [®] lotion	33055A	3
chiesi/gehe	Asche Basis [®] lotion	33056A	2
Chiesi	Asche Basis [®] lotion	333056A	2
Caelo	Asche Basis [®] lotion	32054A	1
Chiese	Asche Basis [®] lotion	41060A	1
chiesi/gehe	Asche Basis [®] lotion	34058A	1

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Supplier	Substance	Batch	Spectra
Chiesi	Asche Basis [®] lotion	32054A	1
Chiesi	Asche Basis [®] lotion	41059A	1
Chiesi/ Phönix	Asche Basis [®] lotion	43066A	1
gehe/Chiesi	Asche Basis [®] lotion	43066A	1
Phoenix	Asche Basis [®] lotion	52069A	1
Gehe20.10.15	Asche Basis [®] lotion	52070A	1
Chiesi GmbH / Phönix	Asche Basis [®] lotion	51067A	1
Chiesi	Asche Basis [®] lotion	43066A	1
Chiesi/Phoenix	Asche Basis [®] lotion	52070A	1
Chiesi GmbH	Asche Basis [®] lotion	53071A	3
Chiesi/Phönix	Asche Basis [®] lotion	53071A	1
Chiesi/Phoenix	Asche Basis [®] lotion	53071A	1
Chiesi GmbH/Gehe	Asche Basis [®] lotion	53072A	1
Chiesi GmbH	Asche Basis [®] lotion	53072A	2
Chiesi/Fa.Gehe	Asche Basis [®] lotion	53075A	1
Caelo	Asche Basis [®] lotion	53072A	1
Caelo	Asche Basis [®] lotion	53073A	3
Chiesi	Asche Basis [®] lotion	53075A	1
Chiesi	Asche Basis [®] lotion	53073A	1
Gehe Chiesi	Asche Basis [®] lotion	53075A-20160615Ma5	1
Fa.Gehe	Asche Basis [®] lotion	20160727Ma5	1
Chiesi GmbH	Asche Basis [®] lotion	53074A	1
Chiesi GmbH	Asche Basis [®] lotion	61076A	2
Chiesi/Noweda	Asche Basis [®] lotion	61077A	1
Chiesi	Asche Basis [®] lotion	61077A	1
Chiesi GmbH	Asche Basis [®] lotion	63078A	2
Chiesi GmbH	Asche Basis [®] lotion	63079A	2
Chiesi/E+J	Asche Basis [®] lotion	64082A	1
Chiesi	Asche Basis [®] lotion	64082A	1
Chiesi/Fiebig	Asche Basis [®] lotion	63980A	1
Noweda	Asche Basis [®] lotion	63980A	1
Chiesi/Phoenix	Asche Basis [®] lotion	64082A	1
Chiesi GmbH	Asche Basis [®] lotion	63980A	1
Chiesi-Fa.Gehe	Asche Basis [®] lotion	64082A-20180112Ma3	1
Chiesi-Fa.Gehe	Asche Basis [®] lotion	73086A-20180206Ma8	1
Chiesi-Fa.Gehe	Asche Basis [®] lotion	73087A-20180206Ma9	1
Chiesi GmbH	Asche Basis [®] lotion	73087A	1
Chiesi/Phönix	Asche Basis [®] lotion	73086A	1
Chiesi	Asche Basis [®] lotion	75085A	1
Caelo	Asche Basis [®] lotion	73089A	1
Chiesi	Asche Basis [®] lotion	73088A	1
Chiesi-Fa.Gehe 19.7.18	Asche Basis [®] lotion	74090A-20180830Ma10	1
Chiesi-Fa.Gehe	Asche Basis [®] lotion	82093A-A20181115Ma1	1
Actavis / Noweda	Abitima [®] clinic face cream	142371	1
Noweda	Abitima [®] clinic face cream	146735	1
actavis	Abitima [®] clinic face cream	148496	2
actavis	Abitima [®] clinic face cream	148495	1
Actavis / Anzag	Abitima [®] clinic face cream	148024	1
Actavis/Gehe	Abitima [®] clinic face cream	148495	1
Caelo	Abitima [®] clinic face cream	146735	1
Phoenix/actavis	Abitima [®] clinic face cream	148460	1
actavis	Abitima [®] clinic face cream	150202	1
Actavis / Anzag	Abitima [®] clinic face cream	148503	1
actavis	Abitima [®] clinic face cream	150203	2
Caelo	Abitima [®] clinic face cream	149666	2
Actavis / Anzag	Abitima [®] clinic face cream	150237	1
Fagron	Abitima [®] clinic face cream	150204	1
Persano/Gehe	Abitima [®] clinic face cream	57792	1
Actavis/GEHE	Abitima [®] clinic face cream	148051	1
Actavis/Phönix	Abitima [®] clinic face cream	159274	2

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Supplier	Substance	Batch	Spectra
Caelo	Abitima [®] clinic face cream	161468	2
Actavis	Abitima [®] clinic face cream	160670	1
actavis group	Abitima [®] clinic face cream	161468	1
Actavis / Gehe	Abitima [®] clinic face cream	161904	3
Actavis/Noweda	Abitima [®] clinic face cream	161423	1
Actavis/Phönix	Abitima [®] clinic face cream	164225	1
Taoasis	Base cream Taoasis	150219-4350	1
Taoasis	Base cream Taoasis	150326-5079	1
Taoasis	Base cream Taoasis	160201-6027	1
Taoasis	Base cream Taoasis	161124-6322	1
Caelo	Base cream Taoasis	170110-6322	1
Taoasis	Base cream Taoasis	170110-6322	1
Taoasis/Sanacorp	Base cream Taoasis	170317-7031	3
Taoasis/Sanacorp	Base cream Taoasis	170517-7100	2
/Sanacorp	Base cream Taoasis	180718-7100	4
Taoasis/Sanacorp	Base cream Taoasis	1807187100	1
Taoasis	Base cream Taoasis	170517-7100	1
Taoasis/Sanacorp	Base cream Taoasis	171127-7290	10
Caelo	Base cream Taoasis	171127-7290	1
Taoasis/Sanacorp	Base cream Taoasis	180924-8114	1
Taoasis/Sanacorp	Base cream Taoasis	180515-8030	1
Bombastus	Base cream Taoasis	180307	1
Sanofi / Gehe	Dermatop [®] base cream	4F046A	1
Sanofi Aventis	Dermatop [®] base cream	4F046A	1
Sanofi	Dermatop [®] base cream	4F046A	1
Sanofi/Anzag	Dermatop [®] base cream	5F051A	1
Sanofi/Gehe	Dermatop [®] base cream	4F050A	1
Sanofi/Phönix	Dermatop [®] base cream	5F051A	1
Sanofi/Noweda	Dermatop [®] base cream	5F056A	1
Sanofi/Anzag	Dermatop [®] base cream	5F056A	1
Koko GmbH	DMS [®] base cream high classic	L031A14	1
KOKO	DMS [®] base cream high classic	L031A14	1
Caelo	DMS [®] base cream high classic	L010J15	1
KOKO GmbH	DMS [®] base cream high classic	L030L16	3
KOKO GmbH & Co. KG	DMS [®] base cream high classic	L054B16	1
Koko GmbH	DMS [®] base cream high classic	L019H17	1
Koko GmbH	DMS [®] base cream high classic	L033J17	3
Koko GmbH	DMS [®] base cream high classic	L031D18	1
KOKO GmbH	DMS [®] base cream classic	L005A14	1
KOKO GmbH	DMS [®] base cream classic	L003E16	1
Koko GmbH&Co KG	DMS [®] base cream classic	L038J16	1
KOKO GmbH & Co. KG	DMS [®] base cream high classic...	L018D16	1
Koko GmbH	DMS [®] base cream high classic...	L035F17	1
Hans Karrer / Anzag	Hans Karrer Lipolotion Micro...	16004	1
Hans Karrer/Gehe	Hans Karrer Lipolotion Micro...	17002	20
Allergika Pharma GmbH	Allergika [®] Base cream		1

- 3216 spectra from 383 *Apo-Ident* customers from a total of 1595 batches from a further 116 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Hydrophilic ointments* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose,

all relevant spectra of the various substances were compared with *Hydrophilic ointments* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	2700	0	17 978
Type B	0	2091	79	20 581
Type C	0	932	64	3200

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9551 %)	100.0000 % (> 99.7778 %)
Type B	100.0000 % (> 99.9529 %)	96.3594 % (> 96.2212 %)
Type C	100.0000 % (> 98.5903 %)	93.5743 % (> 93.2731 %)

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

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

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

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
32177	32177	0.00	26.23
31873	31873	0.00	25.55
34043	34043	0.00	23.80
31236	31236	0.00	34.41
31308	31308	0.00	45.44
31870	31870	0.00	40.34
31115	31115	0.00	34.22
31578	31578	0.00	31.30
31539	31539	0.00	21.95
31058	31058	0.00	39.79
31050	31050	0.00	29.83
33213	33213	0.00	22.94
31061	31061	0.00	42.39
31095	31095	0.00	29.45
32997	32997	0.00	43.78
30635	30635	0.00	34.60
33969	33969	0.00	45.10
30828	30828	0.00	21.64
31068	31068	0.00	27.53
33737	33737	0.00	24.04

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Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
31067	31067	0.00	38.58
33270	33270	0.00	38.19
33194	33194	0.00	32.15
31730	31730	0.00	26.41
31070	31070	0.00	18.85
33195	33195	0.00	33.53
34119	34119	0.00	22.18
31772	31772	0.00	19.25
34117	34117	0.00	32.64
31072	31072	0.00	38.06
30993	30993	0.00	31.32
30713	30713	0.00	26.24
31535	31535	0.00	34.39
32767	32767	0.00	27.43
30775	30775	0.00	28.18
34359	34359	0.00	28.38
31085	31085	0.00	25.49
30845	30845	0.00	17.75
31307	31307	0.00	15.43
31309	31309	0.00	36.42
32178	32178	0.00	36.97
30722	30722	0.00	45.82
31102	31102	0.00	45.61
31089	31089	0.00	20.67
31761	31761	0.00	42.18
33668	33668	0.00	31.29
33208	33208	0.00	22.92
33669	33669	0.00	30.07
30725	30725	0.00	32.65
33793	33793	0.00	15.87
31041	31041	0.00	19.52
32916	32916	0.00	40.98
34360	34360	0.00	16.79
33968	33968	0.00	40.71
34044	34044	0.00	21.30
31511	31511	0.00	21.82
31874	31874	0.00	24.46
31234	31234	0.00	29.05
31869	31869	0.00	15.63
31281	31281	0.00	28.97
30634	30634	0.00	25.79
30732	30732	0.00	38.27
31280	31280	0.00	34.99
30733	30733	0.00	32.20
31066	31066	0.00	29.53

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Immortelle oil**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 30450-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Immortelle oil; Oleum helichrysum italicum

Special notes

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

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Immortelle oil*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Taoasis	Immortelle oil	L24113D-113148BAG90451	31138	40	not required
Taoasis	Immortelle oil	L24415DN-122092BAG90451	32069	40	not required
Taoasis	Immortelle oil	114717DNJ-137	33727	40	not required
Primavera	Immortelle oil	00324A27	34383	40	not required

Validation samples

A total of 48 238 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 *Immortelle oil*. These samples are listed above in the [calibration samples](#) section.
- 20 518 spectra from a total of 482 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 100 spectra of 3 reference samples from the substance/substance group *Immortelle oil*.

Supplier	Substance	Batch	Sample ID	Spectra
Taoasis	Immortelle oil	L24415DN-122092BAG90451	32069 [†]	20
Taoasis	Immortelle oil	L17716DN-126770	32975	40
Taoasis	Immortelle oil	L17716DN-124955	33021	40

- 23 248 spectra from a total of 575 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 3 spectra from 2 *Apo-Ident* customers from 2 batches from the substance/substance group *Immortelle oil*.

[†]These spectra were recorded from 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
Taoasis	Immortelle oil	L03111DN	1
Taoasis	Immortelle oil	L38914DN-118878	2

- 4209 spectra from 396 *Apo-Ident* customers from a total of 2109 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Immortelle oil* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Immortelle oil* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 518
Type B	0	100	0	23 248
Type C	0	3	0	4209

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9555 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9509 %)	100.0000 % (> 94.0000 %)
Type C	100.0000 % (> 98.5583 %)	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
34383	34383	0.00	28.78
31138	31138	0.00	24.44
32069	32069	0.00	21.13
33727	33727	0.00	30.90

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Juniper oil**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 31559-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Juniper oil; Oleum juniperi e baccaræ

Special notes

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

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Juniper oil*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Taoasis	Juniper oil	4155-116757	31559	40	not required
Taoasis	Juniper oil	4155-120900	31687	40	not required
Taoasis	Juniper oil	02JB0B-126047	32809	40	not required

Validation samples

A total of 48 238 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 *Juniper oil*. These samples are listed above in the [calibration samples](#) section.
- 20 558 spectra from a total of 483 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 160 spectra of 5 reference samples from the substance/substance group *Juniper oil*.

Supplier	Substance	Batch	Sample ID	Spectra
Taoasis	Juniper oil	4155-116757	31559 [†]	20
Taoasis	Juniper oil	4155-120900	31687 [†]	20
Taoasis	Juniper oil	02JB0B-127283	32932	40
Taoasis	Juniper oil	1713-128196	33651	40
Primavera	Juniper oil	00497L26	34398	40

- 23 188 spectra from a total of 573 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 2 spectra from 2 *Apo-Ident* customers from 2 batches from the substance/substance group *Juniper oil*.

[†]These spectra were recorded from 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
Taoasis	Juniper oil	155-118896	1
Caelo	Juniper oil	16160706	1

- 4210 spectra from 396 *Apo-Ident* customers from a total of 2109 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Juniper oil* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Juniper oil* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 558
Type B	0	116	44	23 188
Type C	0	2	0	4210

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9556 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9508 %)	72.5000 % (> 70.6250 %)
Type C	100.0000 % (> 98.5703 %)	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
31559	31559	0.00	26.77
31687	31687	0.00	28.29
32809	32809	0.00	24.21

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group	La Roche-Posay Cold Cream Naturel
Substance class	APIs & excipients, liquid/semi-solid (other)
Report date	24/05/2019
Report number	30829-2019-05-24
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

La Roche-Posay Cold Cream Naturel

Special notes

When selecting the *La Roche-Posay Cold Cream Naturel* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-6679-5	<i>European Pharmacopoeia 9th Edition, Basic Version 2017</i> [3]
Komm2.2.40	<i>Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident</i> [4]
AA004	<i>Erstellung und Validierung eines IdentModul-Updates</i>
Appendix F	Addition to the second-stage models

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *La Roche-Posay Cold Cream Naturel*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
La Roche-Posay	La Roche-Posay C...	54J01P	30829	40	not required
La Roche-Posay	La Roche-Posay C...	54K31P	31074	40	not required
La Roche-Posay	La Roche-Posay C...	54LN1P	31765	40	not required

Validation samples

A total of 48 238 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 *La Roche-Posay Cold Cream Naturel*. These samples are listed above in the [calibration samples](#) section.
- 20 558 spectra from a total of 483 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 100 spectra of 3 reference samples from the substance/substance group *La Roche-Posay Cold Cream Naturel*.

Supplier	Substance	Batch	Sample ID	Spectra
La Roche-Posay	La Roche-Posay Cold Cream Na...	54LN1P	31765 [†]	20
La Roche-Posay	La Roche-Posay Cold Cream Na...	54M51P	33262	40
La Roche-Posay	La Roche-Posay Cold Cream Na...	54P61P	33984	40

- 23 248 spectra from a total of 575 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 4 spectra from 2 *Apo-Ident* customers from 4 batches from the substance/substance group *La Roche-Posay Cold Cream Naturel*.

Supplier	Substance	Batch	Spectra
La Roche-Posay	La Roche-Posay Cold Cream Na...	54M11P	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
La Roche-Posay	La Roche-Posay Cold Cream Na...	54M91P	1
Mea-SanacorpWE10.02.201...	La Roche-Posay Cold Cream Na...	L0T54M91P	1
La Roche-Posay	La Roche-Posay Cold Cream Na...	54M01P	1

- 4208 spectra from 396 *Apo-Ident* customers from a total of 2107 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *La Roche-Posay Cold Cream Naturel* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *La Roche-Posay Cold Cream Naturel* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 558
Type B	0	100	0	23 248
Type C	0	4	0	4208

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9556 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9509 %)	100.0000 % (> 94.0000 %)
Type C	100.0000 % (> 98.5524 %)	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
30829	30829	0.00	84.46
31074	31074	0.00	86.55
31765	31765	0.00	83.51

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **La Roche-Posay Toleriane**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 30827-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

La Roche-Posay Toleriane

Special notes

When selecting the *La Roche-Posay Toleriane* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *La Roche-Posay Toleriane*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
La Roche-Posay	La Roche-Posay T...	54J901	30827	40	not required
La Roche-Posay	La Roche-Posay T...	54K500	31094	40	not required
La Roche-Posay	La Roche-Posay T...	54N201	32563	40	not required

Validation samples

A total of 48 238 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 *La Roche-Posay Toleriane*. These samples are listed above in the [calibration samples](#) section.
- 20 558 spectra from a total of 483 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 80 spectra of 2 reference samples from the substance/substance group *La Roche-Posay Toleriane*.

Supplier	Substance	Batch	Sample ID	Spectra
La Roche-Posay	La Roche-Posay Toleriane	54N600	32759	40
La Roche-Posay	La Roche-Posay Toleriane	54P401	33983	40

- 23 268 spectra from a total of 576 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 7 spectra from 2 *Apo-Ident* customers from 4 batches from the substance/substance group *La Roche-Posay Toleriane*.

Supplier	Substance	Batch	Spectra
Roche/AHD	La Roche-Posay Toleriane	54J800	1
Caelo	La Roche-Posay Toleriane	54J500	1
Gehe	La Roche-Posay Toleriane	54P802	4
Roche Posay/Gehe	La Roche-Posay Toleriane	54R1011	1

- 4205 spectra from 396 *Apo-Ident* customers from a total of 2107 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *La Roche-Posay Toleriane* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *La Roche-Posay Toleriane* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 558
Type B	0	80	0	23 268
Type C	0	7	0	4205

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9556 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9510 %)	100.0000 % (> 92.5000 %)
Type C	100.0000 % (> 98.5447 %)	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
30827	30827	0.00	31.23
31094	31094	0.00	25.12
32563	32563	0.00	29.88

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Lemon grass oil**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 30661-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Lemon grass oil; Cymbopogonis aetheroleum

Special notes

When selecting the *Lemon grass oil* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Lemon grass oil*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Bombastus	Lemon grass oil	263571	30661	40	not required
Bombastus	Lemon grass oil	278923	31185	40	not required
Bombastus	Lemon grass oil	278526	31187	40	not required
Taoasis	Lemon grass oil	130930-116754	31549	40	not required

Validation samples

A total of 48 238 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 *Lemon grass oil*. These samples are listed above in the [calibration samples](#) section.
- 20 518 spectra from a total of 482 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 140 spectra of 4 reference samples from the substance/substance group *Lemon grass oil*.

Supplier	Substance	Batch	Sample ID	Spectra
Taoasis	Lemon grass oil	130930-116754	31549 [†]	20
Taoasis	Lemon grass oil	1448-127048	32977	40
Bombastus	Lemon grass oil	294338	33012	40
Primavera	Lemon grass oil	00536M26	34370	40

- 23 208 spectra from a total of 574 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 8 spectra from 6 *Apo-Ident* customers from 8 batches from the substance/substance group *Lemon grass oil*.

[†]These spectra were recorded from 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
Bombastus	Lemon grass oil	270423	1
Taoasis	Lemon grass oil	532897-111140	1
Taoasis	Lemon grass oil	13131-112982	1
Primavera	Lemon grass oil	11401144	1
Taoasis	Lemon grass oil	130930-115336	1
Taoasis	Lemon grass oil	8911011-121890	1
Taoasis	Lemon grass oil	FFL457-123568	1
Taoasis	Lemon grass oil	1663-125423	1

- 4204 spectra from 396 *Apo-Ident* customers from a total of 2103 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Lemon grass oil* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Lemon grass oil* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 518
Type B	0	137	3	23 208
Type C	0	8	0	4204

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9555 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9508 %)	97.8571 % (> 95.7143 %)
Type C	100.0000 % (> 98.5434 %)	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
30661	30661	0.00	41.33
31185	31185	0.00	34.06
31549	31549	0.00	39.56
31187	31187	0.00	31.53

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Lime oil**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 31544-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Lime oil; Oleum citrus aurantifolia

Special notes

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

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Lime oil*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Taoasis	Lime oil	059-117571	31544	40	not required
Taoasis	Lime oil	15506-1458	33874	40	not required
Taoasis	Lime oil	15506-1762	33942	40	not required

Validation samples

A total of 48 238 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 *Lime oil*. These samples are listed above in the [calibration samples](#) section.
- 20 558 spectra from a total of 483 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 160 spectra of 4 reference samples from the substance/substance group *Lime oil*.

Supplier	Substance	Batch	Sample ID	Spectra
Taoasis	Lime oil	059-117571	31544 [†]	20
Taoasis	Lime oil	059-117571	31654	60
Taoasis	Lime oil	867-124956	32800	40
Taoasis	Lime oil	867-124956	32976	40

- 23 188 spectra from a total of 576 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 1 spectra from 1 *Apo-Ident* customers from 1 batches from the substance/substance group *Lime oil*.

Supplier	Substance	Batch	Spectra
Taoasis	Lime oil	867-124956	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*.

- 4211 spectra from 396 *Apo-Ident* customers from a total of 2110 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Lime oil* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Lime oil* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 558
Type B	0	131	29	23 188
Type C	0	1	0	4211

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9556 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9508 %)	81.8750 % (> 80.0000 %)
Type C	100.0000 % (> 98.6061 %)	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
31544	31544	0.00	39.16
33874	33874	0.00	41.77
33942	33942	0.00	41.06

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group	Liniment ointments
Substance class	APIs & excipients, liquid/semi-solid (other)
Report date	24/05/2019
Report number	30731-2019-05-24
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Liniment ointments; Amciderm[®] Base cream; Excipial[®] U Hydrolotio; Linola[®] O/W cream; Linola[®] Sept; Nourivan[™] Antiox

Special notes

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

no information

Applicable documents

978-3-7692-6679-5	<i>European Pharmacopoeia 9th Edition, Basic Version 2017</i> [3]
Komm2.2.40	<i>Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident</i> [4]
AA004	<i>Erstellung und Validierung eines IdentModul-Updates</i>
Appendix F	Addition to the second-stage models

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Liniment ointments*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Spirig Pharma	Excipial [®] U Hydr...	M016	30731	40	not required
Dr. Wolff	Linola [®] O/W cream	238482	30834	40	not required
Spirig Pharma	Excipial [®] U Hydr...	M063	31073	40	not required
Dr. Wolff	Linola [®] Sept	334080	31079	40	not required

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Dr. Wolff	Linola [®] O/W cream	334010	31133	40	not required
Spirig Pharma	Excipial [®] U Hydr...	N013	31279	40	not required
Dr. Wolff	Linola [®] O/W cream	432480	31312	20	not required
Fagron	Nourivan [™] Antiox	14C11-T09-010959	31495	40	not required
Almirall	Amciderm [®] Base c...	313311	31509	40	not required
Spirig Pharma	Excipial [®] U Hydr...	R014	31536	40	not required
Almirall	Amciderm [®] Base c...	313311	31628	55	not required
Dr. Wolff	Linola [®] Sept	509361	31856	40	not required
Fagron	Nourivan [™] Antiox	1503258	31958	30	not required
Almirall	Amciderm [®] Base c...	650341	33502	40	not required
Fagron	Nourivan [™] Antiox	1703842	33789	30	not required
Dr. Wolff	Linola [®] Sept	707990	34126	40	not required

Validation samples

A total of 48 238 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 615 spectra of 16 reference samples from the substance/substance group *Liniment ointments*. These samples are listed above in the [calibration samples](#) section.
- 20 063 spectra from a total of 472 batches from further 154 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 560 spectra of 18 reference samples from the substance/substance group *Liniment ointments*.

Supplier	Substance	Batch	Sample ID	Spectra
Dr. Wolff	Linola [®] O/W cream	432480	31312 [†]	20
Fagron	Nourivan [™] Antiox	14C11-T09-010959	31495 [†]	20
Almirall	Amciderm [®] Base cream	313311	31509 [†]	20
Spirig Pharma	Excipial [®] U Hydrolotio	R014	31536 [†]	20
Almirall	Amciderm [®] Base cream	313311	31628 [†]	20
Dr. Wolff	Linola [®] Sept	509361	31856 [†]	20
Fagron	Nourivan [™] Antiox	1503258	31958 [†]	30
Almirall	Amciderm [®] Base cream	538331	32758	40
Dr. Wolff	Linola [®] Sept	603190	32760	40
Fagron	Nourivan [™] Antiox	1503258	32778	40
Fagron	Nourivan [™] Antiox	1503258	32822	40
Spirig Pharma	Excipial [®] U Hydrolotio	S061	33206	40

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Supplier	Substance	Batch	Sample ID	Spectra
Dr. Wolff	Linola [®] Sept	603190	33257	40
Dr. Wolff	Linola [®] O/W cream	610960	33259	40
Fagron	Nourivan [™] Antiox	1703842	33789 [†]	10
Spirig Pharma	Excipial [®] U Hydrolotio	V052	33981	40
Dr. Wolff	Linola [®] O/W cream	801520	34129	40
Almirall	Amciderm [®] Base cream	822351	34365	40

- 22 788 spectra from a total of 564 batches from further 199 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 127 spectra from 43 *Apo-Ident* customers from 75 batches from the substance/substance group *Liniment ointments*.

Supplier	Substance	Batch	Spectra
Phoenix/Spirig	Excipial [®] U Hydrolotio	M016	1
Spirig	Excipial [®] U Hydrolotio	N013	1
Spirig	Excipial [®] U Hydrolotio	N013	1
Spirig Pharma AG/Noweda	Excipial [®] U Hydrolotio	R054	1
Galderma	Excipial [®] U Hydrolotio	L0TR054	1
Galderma/Noweda	Excipial [®] U Hydrolotio	R054	1
Spirig Pharma AG/ NOWEDA	Excipial [®] U Hydrolotio	L0TN022	1
Noweda	Excipial [®] U Hydrolotio	S061	1
Caelo	Excipial [®] U Hydrolotio	L0TR092	1
Galderma	Excipial [®] U Hydrolotio	T011	1
Dr. August Wolff	Linola [®] O/W cream	233140	1
Dr. Wolff/ Anzag	Linola [®] O/W cream	234193	1
Caelo	Linola [®] O/W cream	238520	2
Caelo	Linola [®] O/W cream	238484	1
Dr. Wolff	Linola [®] O/W cream	236290	1
Dr. Wolff	Linola [®] O/W cream	238520	2
Caelo	Linola [®] O/W cream	236281	1
Dr. Wolff/Gehe	Linola [®] O/W cream	238520	1
Dr. Wolff	Linola [®] O/W cream	238484	1
Dr. Wolff/Anzag	Linola [®] O/W cream	238520	2
Caelo	Linola [®] O/W cream	239181	1
Dr. Wolff	Linola [®] O/W cream	238482	1
DR. WOLFF	Linola [®] O/W cream	234192	1
Dr. Wolff	Linola [®] O/W cream	233200	1
Dr. Wolff/Noweda	Linola [®] O/W cream	233200	1
Caelo	Linola [®] O/W cream	238530	2
Dr. Wolff	Linola [®] O/W cream	238530	1
chiesi / Noweda	Linola [®] O/W cream	331460	1
Dr. Wolff/Malteser	Linola [®] O/W cream	330751	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
Dr. Wolff	Linola [®] O/W cream	238530	2
Wolff/Sanacorp	Linola [®] O/W cream	333630	2
Caelo	Linola [®] O/W cream	330760	1
Dr. Wolff	Linola [®] O/W cream	334003	1
Phoenix/Wolff	Linola [®] O/W cream	333640	1
Dr. August Wolff/Ebert	Linola [®] O/W cream	333640	2
Dr. Wolff	Linola [®] O/W cream	333640	1
Dr. Wolff / Sanacorp	Linola [®] O/W cream	338990	3
Dr. Wolff/Malteser	Linola [®] O/W cream	333880	1
Euro OTC	Linola [®] O/W cream	333730	1
Dr. Wolff/Gehe	Linola [®] O/W cream	432490	2
Dr. Wolff/Malteser	Linola [®] O/W cream	338990	1
Dr. August Wolff/Ebert	Linola [®] O/W cream	431250	1
Wolff / Noweda	Linola [®] O/W cream	431120	4
Dr. Wolff	Linola [®] O/W cream	432490	1
Dr. August Wolff/Ebert	Linola [®] O/W cream	432970	1
Wolff / Gehe	Linola [®] O/W cream	431130	3
Dr. Wolff	Linola [®] O/W cream	435080	1
Dr. Wolff	Linola [®] O/W cream	431200	3
wolff	Linola [®] O/W cream	434320	1
Dr. Wolff/Gehe	Linola [®] O/W cream	434320	2
Dr. Wolf/GEHE	Linola [®] O/W cream	437110	1
Dr. Wolff	Linola [®] O/W cream	432480	1
Dr. Wolff	Linola [®] O/W cream	435530	1
Dr. Wolff	Linola [®] O/W cream	434430	3
AHD	Linola [®] O/W cream	437110	1
Dr. Wolff	Linola [®] O/W cream	437120	1
Caelo	Linola [®] O/W cream	438350	1
Dr. Wolff	Linola [®] O/W cream	438200	2
Dr. Wolff	Linola [®] O/W cream	438200	1
Dr. Wolff/Gehe	Linola [®] O/W cream	138350	1
Dr. Wolff	Linola [®] O/W cream	504100	1
Dr. Wolff/Gehe	Linola [®] O/W cream	438360	1
Dr. Wolff	Linola [®] O/W cream	508280	1
Dr. Wolff	Linola [®] O/W cream	438360	1
Dr. Wolff	Linola [®] O/W cream	505200	4
Dr. Wolff	Linola [®] O/W cream	512330	1
Dr. Wolff	Linola [®] O/W cream	602300	1
Dr. Wolff	Linola [®] O/W cream	510792	1
Dr. Wolff	Linola [®] O/W cream	602190	3
Dr. Wolff/Gehe	Linola [®] O/W cream	606100	1
Dr. Wolff GmbH / Phoenix	Linola [®] O/W cream	606100	1
Dr. August Wolff	Linola [®] O/W cream	605560	1
Dr. August Wolff	Linola [®] O/W cream	607140	1
Dr. Wolff	Linola [®] O/W cream	605419	1
Dr. August Wolff	Linola [®] O/W cream	505560	1
Dr. August Wolff	Linola [®] O/W cream	608900	1
Dr. Wolff	Linola [®] O/W cream	605410	2
Dr. Wolff	Linola [®] O/W cream	610020	1
Dr. August Wolff GmbH &...	Linola [®] O/W cream	170522LC/701090	1
Noweda/Dr. Wolff	Linola [®] O/W cream	610020	2
Dr. Wolff	Linola [®] O/W cream	610960	1
Caelo	Linola [®] O/W cream	1111111111	1
Dr. Wolff/Sanacorp	Linola [®] O/W cream	701100	1
Dr. Wolff	Linola [®] O/W cream	701330	1
Dr. Wolff	Linola [®] O/W cream	704260	1
Caelo	Linola [®] O/W cream	704260	1
Dr. Wolff/Sanacorp	Linola [®] O/W cream	704270	1
Dr. Wolff/ Noweda	Linola [®] O/W cream	707330	1
Dr. A. Wolff GmbH/Noweda	Linola [®] O/W cream	707510	1

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Supplier	Substance	Batch	Spectra
Krieger	Linola [®] O/W cream	705810	1
Dr. Wolff	Linola [®] O/W cream	705810	1
Galderma/ Noweda	Linola [®] O/W cream	704270	1
Dr. Wolff	Linola [®] O/W cream	707520	2
Dr. Wolff/ Noweda	Linola [®] O/W cream	801630	2
Fagron	Nourivan [™] Antiox	1503258	2
Fagron	Nourivan [™] Antiox	150325	1

- 4085 spectra from 396 *Apo-Ident* customers from a total of 2041 batches from a further 132 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	615	0	20 063
Type B	0	508	52	22 657
Type C	0	121	6	4084

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9552 %)	100.0000 % (> 99.0244 %)
Type B	100.0000 % (> 99.9521 %)	90.7143 % (> 90.1786 %)
Type C	100.0000 % (> 98.5708 %)	95.2756 % (> 92.9134 %)

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

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

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

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
31958	31958	0.00	22.79
31133	31133	0.00	34.37
30834	30834	0.00	34.68
31079	31079	0.00	35.75
34126	34126	0.00	37.58
31312	31312	0.00	31.61
31495	31495	0.00	22.37
33789	33789	0.00	20.96
31509	31509	0.00	34.36
31628	31628	0.00	34.44
33502	33502	0.00	36.38
30731	30731	0.00	13.61
31073	31073	0.00	13.31
31856	31856	0.00	34.56
31279	31279	0.00	13.19
31536	31536	0.00	13.40

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group	Linola[®] fat creme / Linola[®] H fat N / Alfason[®] R...
Substance class	APIs & excipients, liquid/semi-solid (other)
Report date	24/05/2019
Report number	30724-2019-05-24
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Linola[®] fat creme / Linola[®] H fat N / Alfason[®] Repair; Alfason[®] Repair; Linola[®] fat cream; Linola[®] H fat N

Special notes

When selecting the *Linola[®] fat creme / Linola[®] H fat N / Alfason[®] Repair* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-6679-5	<i>European Pharmacopoeia 9th Edition, Basic Version 2017</i> [3]
Komm2.2.40	<i>Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident</i> [4]
AA004	<i>Erstellung und Validierung eines IdentModul-Updates</i>
Appendix F	Addition to the second-stage models

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Linola[®] fat creme / Linola[®] H fat N / Alfason[®] Repair*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Astellas Pharma	Alfason [®] Repair	12F18/77	30724	50	not required
Dr. Wolff	Linola [®] fat cream	235260	30771	40	not required
Astellas Pharma	Alfason [®] Repair	13E16/76	31069	40	not required
Dr. Wolff	Linola [®] H fat N	333080	31092	40	not required

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continued from previous page

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Dr. Wolff	Linola [®] fat cream	337280	31096	40	not required
Astellas Pharma	Alfason [®] Repair	16G60/75	32993	40	not required
Dr. Wolff	Linola [®] H fat N	611060	33211	40	not required
Dr. Wolff	Linola [®] fat cream	611011	33243	40	not required
Dr. Wolff	Linola [®] fat cream	612211	33260	40	not required
LEO Pharma GmbH	Alfason [®] Repair	17E20/75	33790	40	not required
Dr. Wolff	Linola [®] H fat N	801410	34128	40	not required

Validation samples

A total of 48 238 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 450 spectra of 11 reference samples from the substance/substance group *Linola[®] fat creme / Linola[®] H fat N / Alfason[®] Repair*. These samples are listed above in the [calibration samples](#) section.
- 20 228 spectra from a total of 475 batches from further 156 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 245 spectra of 7 reference samples from the substance/substance group *Linola[®] fat creme / Linola[®] H fat N / Alfason[®] Repair*.

Supplier	Substance	Batch	Sample ID	Spectra
Astellas Pharma	Alfason [®] Repair	12F18/77	30724 [†]	5
Dr. Wolff	Linola [®] H fat N	603230	32560	40
Dr. Wolff	Linola [®] fat cream	603820	32561	40
Astellas Pharma	Alfason [®] Repair	15K07/77	32562	40
Dr. Wolff	Linola [®] H fat N	611060	33038	40
Dr. Wolff	Linola [®] fat cream	607250	34125	40
Dr. Wolff	Linola [®] fat cream	802990	34253	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*.

- 23 103 spectra from a total of 571 batches from further 201 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 21 spectra from 15 *Apo-Ident* customers from 19 batches from the substance/substance group *Linola® fat creme / Linola® H fat N / Alfason® Repair*.

Supplier	Substance	Batch	Spectra
Astellas	Alfason® Repair	13H02/76	1
Phoenix	Alfason® Repair	15/03/75	1
Phönix	Alfason® Repair	15J09/75	1
Löwen City-Apotheke Bar...	Linola® fat cream	231060	1
Dr. Wolff /Anzag	Linola® fat cream	237710	1
Dr. Wolff	Linola® fat cream	237920	1
Caelo	Linola® fat cream	238540	1
Phönix	Linola® fat cream	238540	1
Wolff/Phönix	Linola® fat cream	337770	1
dr.wolff	Linola® fat cream	337760	1
Dr. Wolff / Gehe	Linola® fat cream	337860	1
dr.wolff	Linola® fat cream	337770	1
Dr. Wolff	Linola® fat cream	432591	1
Wolff / Wolff	Linola® fat cream	431190	1
Dr.Wolff/NOW	Linola® fat cream	435160	1
Caelo	Linola® fat cream	435161	1
Dr. Wolff	Linola® fat cream	437270	1
Dr.Wolff	Linola® fat cream	431160	1
Caelo	Linola® fat cream	438070	1
Dr.Wolff/Sanacorp	Linola® fat cream	700320	1
Dr.Wolff/Sanacorp	Linola® fat cream	704020	1

- 4191 spectra from 396 *Apo-Ident* customers from a total of 2092 batches from a further 133 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Linola® fat creme / Linola® H fat N / Alfason® Repair* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Linola® fat creme / Linola® H fat N / Alfason® Repair* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 228
Type B	0	245	0	23 086
Type C	0	20	1	4191

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9552 %)	100.0000 % (> 98.6667 %)
Type B	100.0000 % (> 99.9514 %)	100.0000 % (> 97.5510 %)
Type C	100.0000 % (> 98.5379 %)	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
30771	30771	0.00	19.18
31096	31096	0.00	22.77
32993	32993	0.00	14.91
33243	33243	0.00	24.62
33260	33260	0.00	23.83
31092	31092	0.00	20.97
33211	33211	0.00	26.12
30724	30724	0.00	19.95
34128	34128	0.00	29.30
31069	31069	0.00	8.63
33790	33790	0.00	19.90

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Lipolotio urea 5% F body lotion**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 30973-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Lipolotio urea 5% F body lotion

Special notes

When selecting the *Lipolotio urea 5% F body lotion* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Lipolotio urea 5% F body lotion*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Allergika	Lipolotio urea 5...	1205050	30973	80	not required
Allergika	Lipolotio urea 5...	13112021	31766	40	not required
Allergika	Lipolotio urea 5...	1801022	34362	40	not required

Validation samples

A total of 48 238 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 *Lipolotio urea 5% F body lotion*. These samples are listed above in the [calibration samples](#) section.
- 20 518 spectra from a total of 483 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 100 spectra of 3 reference samples from the substance/substance group *Lipolotio urea 5% F body lotion*.

Supplier	Substance	Batch	Sample ID	Spectra
Allergika	Lipolotio urea 5% F body lot...	13112021	31766 [†]	20
Allergika	Lipolotio urea 5% F body lot...	1502011	32766	40
Allergika	Lipolotio urea 5% F body lot...	1502011	33482	40

- 23 248 spectra from a total of 576 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 0 spectra from 0 *Apo-Ident* customers from 0 batches from the substance/substance group *Lipolotio urea 5% F body lotion*.
- 4212 spectra from 396 *Apo-Ident* customers from a total of 2111 batches from a further 135 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented

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

within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Lipolotio urea 5% F body lotion* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Lipolotio urea 5% F body lotion* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 518
Type B	0	100	0	23 248
Type C	0	0	0	4212

The substance/substance group *Lipolotio urea 5% F body lotion* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9555 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9509 %)	100.0000 % (> 94.0000 %)
Type C	100.0000 % (> 98.5344 %)	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
30973	30973	0.00	29.45
34362	34362	0.00	36.18
31766	31766	0.00	39.88

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Lygal[®] head ointment N 3%**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 31049-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Lygal[®] head ointment N 3%

Special notes

When selecting the *Lygal[®] head ointment N 3%* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Lygal[®] head ointment N 3%*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Taurus	Lygal [®] head oint...	124311	31049	40	not required
Taurus	Lygal [®] head oint...	143710	31763	40	not required

Validation samples

A total of 48 238 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 *Lygal[®] head ointment N 3%*. These samples are listed above in the [calibration samples](#) section.
- 20 598 spectra from a total of 484 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 140 spectra of 4 reference samples from the substance/substance group *Lygal[®] head ointment N 3%*.

Supplier	Substance	Batch	Sample ID	Spectra
Taurus	Lygal [®] head ointment N 3%	143710	31763 [†]	20
Taurus	Lygal [®] head ointment N 3%	160732	32763	40
Taurus	Lygal [®] head ointment N 3%	160732	33261	40
Taurus	Lygal [®] head ointment N 3%	181802	34127	40

- 23 208 spectra from a total of 575 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 2 spectra from 2 *Apo-Ident* customers from 2 batches from the substance/substance group *Lygal[®] head ointment N 3%*.

[†]These spectra were recorded from 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
Almirall	Lygal [®] head ointment N 3%	181908	1
Taurus Pharma	Lygal [®] head ointment N 3%	134507	1

- 4210 spectra from 396 *Apo-Ident* customers from a total of 2109 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Lygal[®] head ointment N 3%* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Lygal[®] head ointment N 3%* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 598
Type B	0	140	0	23 208
Type C	0	2	0	4210

The substance/substance group *Lygal[®] head ointment N 3%* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9558 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9508 %)	100.0000 % (> 95.7143 %)
Type C	100.0000 % (> 98.5703 %)	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
31049	31049	0.00	39.24
31763	31763	0.00	39.03

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Lygal[®] ointment base**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 31014-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Lygal[®] ointment base

Special notes

When selecting the *Lygal[®] ointment base* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Lygal[®] ointment base*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Taurus	Lygal [®] ointment ...	121302P	31014	40	not required
Taurus	Lygal [®] ointment ...	154841	32749	40	not required
Taurus	Lygal [®] ointment ...	164201	32772	40	not required
Taurus	Lygal [®] ointment ...	164201	33244	40	not required
Taurus	Lygal [®] ointment ...	164201	33297	40	not required

Validation samples

A total of 48 238 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 *Lygal[®] ointment base*. These samples are listed above in the *calibration samples* section.
- 20 478 spectra from a total of 483 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this *chemometric model*, the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in *Appendix A*. The samples in *Appendix A* were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 100 spectra of 2 reference samples from the substance/substance group *Lygal[®] ointment base*.

Supplier	Substance	Batch	Sample ID	Spectra
Taurus	Lygal [®] ointment base	124904P	31704	60
Almirall	Lygal [®] ointment base	174104	33988	40

- 23 248 spectra from a total of 576 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this *chemometric model*, the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 32 spectra from 14 *Apo-Ident* customers from 15 batches from the substance/substance group *Lygal[®] ointment base*.

Supplier	Substance	Batch	Spectra
TAUROS PHARMA	Lygal [®] ointment base	124803	1
Taurus	Lygal [®] ointment base	124803	2
Taurus Pharma	Lygal [®] ointment base	133401T	2

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Supplier	Substance	Batch	Spectra
Taurus Pharma	Lygal [®] ointment base	133401P	1
Taurus	Lygal [®] ointment base	133401T	2
TAUROS PHARMA	Lygal [®] ointment base		1
Taurus Pharma / Gehe	Lygal [®] ointment base	133401T	1
Taurus	Lygal [®] ointment base	133402	1
Taurus/ Phönix	Lygal [®] ointment base	133401T	1
Taurus	Lygal [®] ointment base	141601T	1
TAUROS PHARMA	Lygal [®] ointment base	141601P	1
Taurus	Lygal [®] ointment base	141603	2
TAURUS PHARMA	Lygal [®] ointment base	141602T	1
Caelo	Lygal [®] ointment base	141601P	1
TAURUS PHARMA	Lygal [®] ointment base	154841	1
Finteler Apotheke	Lygal [®] ointment base	1704011	1
Taurus / Gehe	Lygal [®] ointment base	1704011	1
Phoenix WE: 08.11.17 20...	Lygal [®] ointment base	1728032	1
Taurus	Lygal [®] ointment base	18121705	1
almirall/gehe	Lygal [®] ointment base	174106	1
Almiral/ Phönix	Lygal [®] ointment base	174106	1
Almiral / Gehe	Lygal [®] ointment base	175007	4
Caelo	Lygal [®] ointment base	174106	1
Almirall	Lygal [®] ointment base	175007	1
Taurus Pharma GmbH	Lygal [®] ointment base	1728032	1

- 4180 spectra from 396 *Apo-Ident* customers from a total of 2096 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Lygal[®] ointment 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 *Lygal[®] ointment 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	200	0	20 478
Type B	0	100	0	23 248
Type C	0	31	1	4180

The substance/substance group *Lygal[®] ointment 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 % (> 99.9554 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9509 %)	100.0000 % (> 94.0000 %)
Type C	100.0000 % (> 98.5367 %)	96.8750 % (> 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
33244	33244	0.00	30.68
32749	32749	0.00	26.73
32772	32772	0.00	34.93
33297	33297	0.00	24.36
31014	31014	0.00	22.22

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Mandarin oil, green**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 33798-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Mandarin oil, green

Special notes

When selecting the *Mandarin oil, green* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Mandarin oil, green*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Primavera	Mandarin oil, gr...	00431E25	33798	40	not required
Primavera	Mandarin oil, gr...	00381H25	33806	40	not required

Validation samples

A total of 48 238 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 *Mandarin oil, green*. These samples are listed above in the [calibration samples](#) section.
- 20 598 spectra from a total of 484 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 80 spectra of 2 reference samples from the substance/substance group *Mandarin oil, green*.

Supplier	Substance	Batch	Sample ID	Spectra
Primavera	Mandarin oil, green	00425M25	33960	40
Primavera	Mandarin oil, green	00350J26	34397	40

- 23 268 spectra from a total of 576 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 0 spectra from 0 *Apo-Ident* customers from 0 batches from the substance/substance group *Mandarin oil, green*.
- 4212 spectra from 396 *Apo-Ident* customers from a total of 2111 batches from a further 135 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Mandarin oil, green* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Mandarin oil, green* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 598
Type B	0	80	0	23 268
Type C	0	0	0	4212

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9558 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9510 %)	100.0000 % (> 92.5000 %)
Type C	100.0000 % (> 98.5344 %)	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
33798	33798	0.00	30.97
33806	33806	0.00	31.51

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Manuka oil**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 31545-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Manuka oil; Oleum leptospermum scoparium

Special notes

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

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Manuka oil*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Taoasis	Manuka oil	1235-116650	31545	40	not required
Taoasis	Manuka oil	14286-119821	31655	40	not required
Taoasis	Manuka oil	83579-2408	33994	40	not required

Validation samples

A total of 48 238 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 *Manuka oil*. These samples are listed above in the [calibration samples](#) section.
- 20 558 spectra from a total of 483 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 160 spectra of 5 reference samples from the substance/substance group *Manuka oil*.

Supplier	Substance	Batch	Sample ID	Spectra
Taoasis	Manuka oil	1235-116650	31545 [†]	20
Taoasis	Manuka oil	14286-119821	31655 [†]	20
Taoasis	Manuka oil	42798-125299	32799	40
Taoasis	Manuka oil	42798-125299	33198	40
Primavera	Manuka oil	00476A27	34390	40

- 23 188 spectra from a total of 574 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 5 spectra from 1 *Apo-Ident* customers from 4 batches from the substance/substance group *Manuka oil*.

[†]These spectra were recorded from 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
Taoasis	Manuka oil	36968-121509	1
Taoasis	Manuka oil	23694-123569	1
Taoasis	Manuka oil	23694-122415	1
Taoasis	Manuka oil	42798-125299	2

- 4207 spectra from 396 *Apo-Ident* customers from a total of 2107 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Manuka oil* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Manuka oil* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 558
Type B	0	160	0	23 188
Type C	0	5	0	4207

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9556 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9508 %)	100.0000 % (> 96.2500 %)
Type C	100.0000 % (> 98.5488 %)	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
31545	31545	0.00	37.00
31655	31655	0.00	36.91
33994	33994	0.00	30.05

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Marjoram oil**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 30454-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Marjoram oil; Majoranae aetheroleum

Special notes

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

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Marjoram oil*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Taoasis	Marjoram oil	130312-111991BAG90451	31137	40	not required
Taoasis	Marjoram oil	3701004-121123	32067	40	not required
Caelo	Marjoram oil	16170005	32819	40	not required
Taoasis	Marjoram oil	1700187-3444	34275	40	not required

Validation samples

A total of 48 238 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 *Marjoram oil*. These samples are listed above in the [calibration samples](#) section.
- 20 518 spectra from a total of 482 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 100 spectra of 3 reference samples from the substance/substance group *Marjoram oil*.

Supplier	Substance	Batch	Sample ID	Spectra
Taoasis	Marjoram oil	3701004-121123	32067 [†]	20
Taoasis	Marjoram oil	1838-125624	32478	40
Caelo	Marjoram oil	16170005	32919	40

- 23 248 spectra from a total of 575 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 25 spectra from 8 *Apo-Ident* customers from 16 batches from the substance/substance group *Marjoram oil*.

[†]These spectra were recorded from 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
Taoasis	Marjoram oil	29293-98717	1
Taoasis/Gehe	Marjoram oil	29293-98717	1
Caelo	Marjoram oil	12041602	7
Caelo	Marjoram oil	13041601	1
Taoasis	Marjoram oil	130312-111347	1
Taoasis	Marjoram oil	130312-111870	1
Bombastus	Marjoram oil	278279	1
Caelo	Marjoram oil	13041603	2
Caelo	Marjoram oil	13121301	1
Caelo	Marjoram oil	13041606	1
Taoasis	Marjoram oil	130910-116960	1
Taoasis	Marjoram oil	130910-117430	1
Caelo	Marjoram oil	14198304	1
Taoasis	Marjoram oil	3701004-119994	2
Taoasis	Marjoram oil	1631-122347	1
Caelo	Marjoram oil	15051505	1
Taoasis	Marjoram oil	1631-124621	1

- 4187 spectra from 396 *Apo-Ident* customers from a total of 2095 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Marjoram oil* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Marjoram oil* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 518
Type B	0	100	0	23 248
Type C	0	24	1	4187

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9555 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9509 %)	100.0000 % (> 94.0000 %)
Type C	100.0000 % (> 98.5373 %)	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
31137	31137	0.00	70.00
32067	32067	0.00	43.04
34275	34275	0.00	67.25
32819	32819	0.00	54.41

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Matricaria oil, morrocan**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 30844-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Matricaria oil, morrocan; Oleum ormenis multicaulis

Special notes

When selecting the *Matricaria oil, morrocan* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Matricaria oil, morrocan*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Taoasis	Matricaria oil, ...	140124-116959	31579	40	not required
Taoasis	Matricaria oil, ...	6121017-122184	31841	40	not required
Taoasis	Matricaria oil, ...	1629-124596	32269	40	not required

Validation samples

A total of 48 238 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 *Matricaria oil, morrocan*. These samples are listed above in the [calibration samples](#) section.
- 20 558 spectra from a total of 483 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 160 spectra of 5 reference samples from the substance/substance group *Matricaria oil, morrocan*.

Supplier	Substance	Batch	Sample ID	Spectra
Taoasis	Matricaria oil, morrocan	6982-1074109BAC90451	30844	40
Taoasis	Matricaria oil, morrocan	140124-116959	31579 [†]	20
Taoasis	Matricaria oil, morrocan	6121017-122184	31841 [†]	20
Taoasis	Matricaria oil, morrocan	1629-125295	32480	40
Taoasis	Matricaria oil, morrocan	1814-126707	33020	40

- 23 188 spectra from a total of 573 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 2 spectra from 1 *Apo-Ident* customers from 2 batches from the substance/substance group *Matricaria oil, morrocan*.

[†]These spectra were recorded from 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
Taoasis	Matricaria oil, morrocan	6631-104465	1
Taoasis	Matricaria oil, morrocan	6159-93239	1

- 4210 spectra from 396 *Apo-Ident* customers from a total of 2109 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Matricaria oil, morrocan* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Matricaria oil, morrocan* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 558
Type B	0	158	2	23 188
Type C	0	1	1	4210

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9556 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9508 %)	98.7500 % (> 96.8750 %)
Type C	100.0000 % (> 98.5703 %)	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
31579	31579	0.00	37.47
31841	31841	0.00	39.71
32269	32269	0.00	48.93

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Matricaria oil, roman**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 31254-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Matricaria oil, roman; Oleum anthemis nobilis

Special notes

When selecting the *Matricaria oil, roman* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Matricaria oil, roman*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Taoasis	Matricaria oil, ...	34561-112874	31254	40	not required
Taoasis	Matricaria oil, ...	1850119-119823	31686	40	not required
Taoasis	Matricaria oil, ...	2033-843	33989	40	not required

Validation samples

A total of 48 238 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 *Matricaria oil, roman*. These samples are listed above in the [calibration samples](#) section.
- 20 558 spectra from a total of 483 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 100 spectra of 3 reference samples from the substance/substance group *Matricaria oil, roman*.

Supplier	Substance	Batch	Sample ID	Spectra
Taoasis	Matricaria oil, roman	1850119-119823	31686 [†]	20
Taoasis	Matricaria oil, roman	8941-125875	32796	40
Taoasis	Matricaria oil, roman	8941-125875	32978	40

- 23 248 spectra from a total of 576 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 7 spectra from 1 *Apo-Ident* customers from 7 batches from the substance/substance group *Matricaria oil, roman*.

Supplier	Substance	Batch	Spectra
Taoasis	Matricaria oil, roman	1850119-116753	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*.

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Supplier	Substance	Batch	Spectra
Taoasis	Matricaria oil, roman	1850119-118138	1
Taoasis	Matricaria oil, roman	1850119-119451	1
Taoasis	Matricaria oil, roman	1511-122183	1
Taoasis	Matricaria oil, roman	1850119-121467	1
Taoasis	Matricaria oil, roman	1638-123706	1
Taoasis	Matricaria oil, roman	8941-125875	1

- 4205 spectra from 396 *Apo-Ident* customers from a total of 2104 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Matricaria oil, roman* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Matricaria oil, roman* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 558
Type B	0	63	37	23 248
Type C	0	7	0	4205

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9556 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9509 %)	63.0000 % (> 60.0000 %)
Type C	100.0000 % (> 98.5447 %)	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
31254	31254	0.00	36.47
31686	31686	0.00	35.45
33989	33989	0.00	35.20

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Melissa 30% (essential oil)**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 33812-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Melissa 30% (essential oil)

Special notes

When selecting the *Melissa 30% (essential oil)* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Melissa 30% (essential oil)*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Primavera	Melissa 30% (ess...	01029J25	33812	40	not required
Primavera	Melissa 30% (ess...	00344A26	33962	40	not required

Validation samples

A total of 48 238 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 *Melissa 30% (essential oil)*. These samples are listed above in the [calibration samples](#) section.
- 20 598 spectra from a total of 484 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 30 spectra of 1 reference samples from the substance/substance group *Melissa 30% (essential oil)*.

Supplier	Substance	Batch	Sample ID	Spectra
Primavera	Melissa 30% (essential oil)	00362G26	34297	30

- 23 318 spectra from a total of 577 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 0 spectra from 0 *Apo-Ident* customers from 0 batches from the substance/substance group *Melissa 30% (essential oil)*.
- 4212 spectra from 396 *Apo-Ident* customers from a total of 2111 batches from a further 135 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Melissa 30% (essential oil)* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Melissa 30% (essential oil)* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 598
Type B	0	30	0	23 318
Type C	0	0	0	4212

The substance/substance group *Melissa 30% (essential oil)* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9558 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9516 %)	100.0000 % (> 80.0000 %)
Type C	100.0000 % (> 98.5344 %)	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
33812	33812	0.00	26.35
33962	33962	0.00	28.78

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Melissa oil**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 33800-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Melissa oil

Special notes

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

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Melissa oil*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Primavera	Melissa oil	00720H25	33800	40	not required
Taoasis	Melissa oil	640	33831	40	not required
Primavera	Melissa oil	00010J26	34298	30	not required
Primavera	Melissa oil	00026A27	34404	40	not required

Validation samples

A total of 48 238 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 *Melissa oil*. These samples are listed above in the [calibration samples](#) section.
- 20 528 spectra from a total of 482 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 40 spectra of 1 reference samples from the substance/substance group *Melissa oil*.

Supplier	Substance	Batch	Sample ID	Spectra
Primavera	Melissa oil	00065E26	34166	40

- 23 308 spectra from a total of 577 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 0 spectra from 0 *Apo-Ident* customers from 0 batches from the substance/substance group *Melissa oil*.
- 4212 spectra from 396 *Apo-Ident* customers from a total of 2111 batches from a further 135 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Melissa oil* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Melissa oil* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 528
Type B	0	0	40	23 308
Type C	0	0	0	4212

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9555 %)	100.0000 % (> 96.0000 %)
Type B	100.0000 % (> 99.9513 %)	0.0000 % (≥ 0.0000 %)
Type C	100.0000 % (> 98.5344 %)	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
33800	33800	0.00	22.25
34298	34298	0.00	18.86
34404	34404	0.00	17.98
33831	33831	0.00	21.73

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Myrrh oil**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 30748-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Myrrh oil; Oleum myrrha

Special notes

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

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Myrrh oil*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Taoasis	Myrrh oil	30007-120958	31692	40	not required
Taoasis	Myrrh oil	41197-124418BAG90451	32271	40	not required
Taoasis	Myrrh oil	2206-2428	33992	40	not required

Validation samples

A total of 48 238 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 *Myrrh oil*. These samples are listed above in the [calibration samples](#) section.
- 20 558 spectra from a total of 483 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 140 spectra of 4 reference samples from the substance/substance group *Myrrh oil*.

Supplier	Substance	Batch	Sample ID	Spectra
Taoasis	Myrrh oil	22920-105398BAG90451	30748	40
Taoasis	Myrrh oil	30007-120958	31692 [†]	20
Taoasis	Myrrh oil	41197-126694	33050	40
Taoasis	Myrrh oil	41197-126694	33051	40

- 23 208 spectra from a total of 575 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 1 spectra from 1 *Apo-Ident* customers from 1 batches from the substance/substance group *Myrrh oil*.

Supplier	Substance	Batch	Spectra
Taoasis	Myrrh oil	2067-107953	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*.

- 4211 spectra from 396 *Apo-Ident* customers from a total of 2110 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Myrrh oil* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Myrrh oil* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 558
Type B	0	98	42	23 208
Type C	0	0	1	4211

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9556 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9508 %)	70.0000 % (> 67.8571 %)
Type C	100.0000 % (> 98.6061 %)	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
31692	31692	0.00	124.95
32271	32271	0.00	173.08
33992	33992	0.00	49.83

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Neroli oil**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 31260-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Neroli oil; Oleum neroli

Special notes

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

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Neroli oil*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Taoasis	Neroli oil	91029-115714	31260	40	not required
Taoasis	Neroli oil	6142-120057BAG90451	31695	40	not required
Taoasis	Neroli oil	0717/4-3018	34283	40	not required
Primavera	Neroli oil	00237B27	34406	40	not required

Validation samples

A total of 48 238 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 *Neroli oil*. These samples are listed above in the [calibration samples](#) section.
- 20 518 spectra from a total of 482 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 140 spectra of 4 reference samples from the substance/substance group *Neroli oil*.

Supplier	Substance	Batch	Sample ID	Spectra
Taoasis	Neroli oil	6142-120057BAG90451	31695 [†]	20
Taoasis	Neroli oil	125052-124958	32805	40
Taoasis	Neroli oil	125052-124958	33042	40
Taoasis	Neroli oil	071704-1966	33993	40

- 23 208 spectra from a total of 575 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

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

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

- 4212 spectra from 396 *Apo-Ident* customers from a total of 2111 batches from a further 135 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Neroli oil* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Neroli oil* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 518
Type B	0	60	80	23 208
Type C	0	0	0	4212

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9555 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9508 %)	42.8571 % (> 40.7143 %)
Type C	100.0000 % (> 98.5344 %)	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
31695	31695	0.00	50.51
31260	31260	0.00	47.20
34283	34283	0.00	53.49
34406	34406	0.00	43.52

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group	Neuroderm [®] moisturising cream lipo
Substance class	APIs & excipients, liquid/semi-solid (other)
Report date	24/05/2019
Report number	30721-2019-05-24
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Neuroderm[®] moisturising cream lipo

Special notes

When selecting the *Neuroderm[®] moisturising cream lipo* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-6679-5	<i>European Pharmacopoeia 9th Edition, Basic Version 2017</i> [3]
Komm2.2.40	<i>Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident</i> [4]
AA004	<i>Erstellung und Validierung eines IdentModul-Updates</i>
Appendix F	Addition to the second-stage models

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Neuroderm[®] moisturising cream lipo*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Infectopharm	Neuroderm [®] moist...	S031202.1	30721	40	not required
Infectopharm	Neuroderm [®] moist...	S031506.1	31672	40	not required
Infectopharm	Neuroderm [®] moist...	S051723.1	34045	40	not required

Validation samples

A total of 48 238 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 *Neuroderm[®] moisturising cream lipo*. These samples are listed above in the [calibration samples](#) section.
- 20 558 spectra from a total of 483 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 100 spectra of 3 reference samples from the substance/substance group *Neuroderm[®] moisturising cream lipo*.

Supplier	Substance	Batch	Sample ID	Spectra
Infectopharm	Neuroderm [®] moisturising crea. . .	S031506.1	31672 [†]	20
Infectopharm	Neuroderm [®] moisturising crea. . .	S071617.2	32739	40
Infectopharm	Neuroderm [®] moisturising crea. . .	S021706.1	33287	40

- 23 248 spectra from a total of 575 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 2 spectra from 2 *Apo-Ident* customers from 2 batches from the substance/substance group *Neuroderm[®] moisturising cream lipo*.

Supplier	Substance	Batch	Spectra
Infectopharm/AHD	Neuroderm [®] moisturising crea. . .		1
Infectopharm	Neuroderm [®] moisturising crea. . .		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*.

- 4210 spectra from 396 *Apo-Ident* customers from a total of 2110 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Neuroderm[®] moisturising cream lipo* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Neuroderm[®] moisturising cream lipo* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 558
Type B	0	100	0	23 248
Type C	0	2	0	4210

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9556 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9509 %)	100.0000 % (> 94.0000 %)
Type C	100.0000 % (> 98.5703 %)	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
30721	30721	0.00	31.02
31672	31672	0.00	24.58
34045	34045	0.00	30.45

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Nicotine**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 31019-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Nicotine

Special notes

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

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Roth	Nicotine	152183017	31019	20	1402687
Roth	Nicotine	194210173	31508	40	1410523
Roth	Nicotine	194210173	31518	40	not required
Roth	Nicotine	116210173	31948	30	not required

Validation samples

A total of 48 238 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 *Nicotine*. These samples are listed above in the [calibration samples](#) section.
- 20 548 spectra from a total of 483 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 95 spectra of 4 reference samples from the substance/substance group *Nicotine*.

Supplier	Substance	Batch	Sample ID	Spectra
Roth	Nicotine	194210173	31508 [†]	20
Roth	Nicotine	194210173	31518 [†]	20
Roth	Nicotine	116210173	31948 [†]	15
Roth	Nicotine	137210173	33291	40

- 23 253 spectra from a total of 575 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

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

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

- 4212 spectra from 396 *Apo-Ident* customers from a total of 2111 batches from a further 135 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	130	0	20 548
Type B	0	95	0	23 253
Type C	0	0	0	4212

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9555 %)	100.0000 % (> 95.3846 %)
Type B	100.0000 % (> 99.9509 %)	100.0000 % (> 93.6842 %)
Type C	100.0000 % (> 98.5344 %)	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
31019	31019	0.00	170.47
31508	31508	0.00	168.82
31518	31518	0.00	169.42
31948	31948	0.00	170.19

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group	Ointment ash basis / Neribas [®]
Substance class	APIs & excipients, liquid/semi-solid (other)
Report date	24/05/2019
Report number	30774-2019-05-24
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Ointment ash basis / Neribas[®]; Asche Basis[®] ointment; Neribas[®] ointment

Special notes

When selecting the *Ointment ash basis / Neribas[®]* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-6679-5	<i>European Pharmacopoeia 9th Edition, Basic Version 2017</i> [3]
Komm2.2.40	<i>Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident</i> [4]
AA004	<i>Erstellung und Validierung eines IdentModul-Updates</i>
Appendix F	Addition to the second-stage models

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Ointment ash basis / Neribas[®]*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Chiesi	Asche Basis [®] oin...	21038A	30774	40	not required
Chiesi	Asche Basis [®] oin...	21038A	30833	40	not required
Bayer	Neribas [®] ointment	21053B	30969	40	not required
Bayer	Neribas [®] ointment	21053B	30994	40	not required
Chiesi	Asche Basis [®] oin...	21038A	31080	40	not required
Jenapharm	Neribas [®] ointment	31064C	31093	40	not required

Validation samples

A total of 48 238 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 *Ointment ash basis / Neribas®*. These samples are listed above in the [calibration samples](#) section.
- 20 438 spectra from a total of 483 batches from further 157 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 240 spectra of 6 reference samples from the substance/substance group *Ointment ash basis / Neribas®*.

Supplier	Substance	Batch	Sample ID	Spectra
Jenapharm	Neribas [®] ointment	YY00TJ0	32564	40
Chiesi	Asche Basis [®] ointment	61067A	32590	40
Chiesi	Asche Basis [®] ointment	61067A	32924	40
Chiesi	Asche Basis [®] ointment	61067A	32927	40
Jenapharm	Neribas [®] ointment	YY016EC	33288	40
Chiesi	Asche Basis [®] ointment	17072A	33840	40

- 23 108 spectra from a total of 574 batches from further 202 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 116 spectra from 33 *Apo-Ident* customers from 49 batches from the substance/substance group *Ointment ash basis / Neribas®*.

Supplier	Substance	Batch	Spectra
Anzag/Ichtyol-Gesellsch...	Asche Basis [®] ointment	23043A	1
Chiesi/Phoenix	Asche Basis [®] ointment	23042A	1
Chiesi/AHD	Asche Basis [®] ointment	31045A	4
Chiesi/AHD	Asche Basis [®] ointment	31047A	1
Phönix	Asche Basis [®] ointment	31047A	1
Caelo	Asche Basis [®] ointment	31047A	1
Chiesi	Asche Basis [®] ointment	32048A	1
Wolff/AHD	Asche Basis [®] ointment	32048A	2
Chiesi Gmbh	Asche Basis [®] ointment	21039A	1
Chiesi/AHD	Asche Basis [®] ointment	33049A	1
Chiesi / Gehe	Asche Basis [®] ointment	33049A	1
Chiesi	Asche Basis [®] ointment	33049A	1
Chiesi	Asche Basis [®] ointment	34051A	1
Chiesi / Gehe	Asche Basis [®] ointment	33050A	1
Chiesi	Asche Basis [®] ointment	41054A	3
Chiesi	Asche Basis [®] ointment	41052A	1
chiesi	Asche Basis [®] ointment	42055A	1
Chiesi/Gehe	Asche Basis [®] ointment	42056A	1
Chiesi/Sanacorp	Asche Basis [®] ointment	41053A	1
chiesi	Asche Basis [®] ointment	44057A	1
Chiesi	Asche Basis [®] ointment	510604	1
Chiesi/Phönix	Asche Basis [®] ointment	51059A	1
CHIESI/ NOWEDA	Asche Basis [®] ointment	51060A	2
Chiesi	Asche Basis [®] ointment	51060A	1
Chiesi GmbH	Asche Basis [®] ointment	52062A	1
Sanacorp/Chiesi WE:31.0...	Asche Basis [®] ointment	41054A	1
Chiesi	Asche Basis [®] ointment	52062A	2
Chiesi GmbH	Asche Basis [®] ointment	52064A	3
Chiesi GmbH	Asche Basis [®] ointment	52063A	3
Chiese/Sanacorp WE:07.0...	Asche Basis [®] ointment	52062A	1
WE:27.02.2016 Sanacor...	Asche Basis [®] ointment	52063A	1
Chiesi GmbH	Asche Basis [®] ointment	53065A	4
Chiesi GmbH	Asche Basis [®] ointment	61066A	2
Caelo	Asche Basis [®] ointment	63068A	3
WE:Sanacorp19.01.2016 ...	Asche Basis [®] ointment	52064A	2
Caelo	Asche Basis [®] ointment	61067A	1
Chiesi GmbH	Asche Basis [®] ointment	63069A	3
WE14.12.16 Chiesi/Sanac...	Asche Basis [®] ointment	61067A	2
SanacorpWE:9.12.2016 ...	Asche Basis [®] ointment	63068A	1
Chiesi	Asche Basis [®] ointment	63068A	1
Chiese	Asche Basis [®] ointment	63069A	1
Sanacorp WE 29.04.17 -8...	Asche Basis [®] ointment	63070A	1
Chiesi GmbH	Asche Basis [®] ointment	63070A	2
Chiesi GmbH	Asche Basis [®] ointment	71071A	1
PPL	Asche Basis [®] ointment	61067A	1
Chiese	Asche Basis [®] ointment	63070A	1
Chiesi/Noweda	Asche Basis [®] ointment	71072A	1
Chiese	Asche Basis [®] ointment	71073A	2
Noweda	Asche Basis [®] ointment	71072A	1
PPL	Asche Basis [®] ointment	71072A	2
Gehe	Asche Basis [®] ointment	17I21-B01	1
Chiesi/Phönix	Asche Basis [®] ointment	72074A	2
chiesi/gehe	Asche Basis [®] ointment	71072A	1
Chiesi GmbH	Asche Basis [®] ointment	71073A	1
Chiesi GmbH	Asche Basis [®] ointment	71072A	1
Chiesi GmbH	Asche Basis [®] ointment	72074A	1
chiesi /Gehe	Asche Basis [®] ointment	73075A	1
PPL	Asche Basis [®] ointment	73075A	1
Chiesi/Phoenix	Asche Basis [®] ointment	73076A	1
Chiesi/Phoenix	Asche Basis [®] ointment	73075A	1

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Supplier	Substance	Batch	Spectra
Bayer/ Sanacorp	Neribas [®] ointment	YY006JT	3
Caelo	Neribas [®] ointment	YY00CC8	1
Jenapharm	Neribas [®] ointment	YY006JT	1
Jenapharm/ Anzag	Neribas [®] ointment	YY00K7E	2
Jenapharm / Anzag	Neribas [®] ointment	YY00THL	1
Jenapharm/ Sanacorp	Neribas [®] ointment	YY00THL	1
Jenapharm/Anzag	Neribas [®] ointment	YY00XEH	2
Jenapharm/Noweda	Neribas [®] ointment	YY00THL	1
Caelo	Neribas [®] ointment	YY00XEH	1
Jenapharm	Neribas [®] ointment	YY00XEH	1
Jenapharm	Neribas [®] ointment	YY016LN	2
Jenapharm	Neribas [®] ointment	YY00TJ0	1
Caelo	Neribas [®] ointment	YY00TJ0	1
Jenapharm	Neribas [®] ointment	YY017LF	1
Caelo	Neribas [®] ointment	YY016LN	1
Caelo	Neribas [®] ointment	YY016EC	1
Jenapharm/Sanacorp	Neribas [®] ointment	YY0180C	1
Jenapharm	Neribas [®] ointment	YY01FX4	3
Jenapharm	Neribas [®] ointment	YY01KHH	1
Jenapharm/Phönix	Neribas [®] ointment	YY01KHH	1
Jenapharm	Neribas [®] ointment	YY01TF3	1
Jenaparm	Neribas [®] ointment	12091812	1
Jenapharm	Neribas [®] ointment	5121811	1

- 4096 spectra from 396 *Apo-Ident* customers from a total of 2062 batches from a further 133 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Ointment ash basis* / *Neribas[®]* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ointment ash basis* / *Neribas[®]* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 438
Type B	0	240	0	23 068
Type C	0	108	8	4096

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9553 %)	100.0000 % (> 97.5000 %)
Type B	100.0000 % (> 99.9514 %)	100.0000 % (> 97.5000 %)
Type C	100.0000 % (> 98.5351 %)	93.1034 % (> 90.5172 %)

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

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

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

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

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
30969	30969	0.00	38.53
30774	30774	0.00	36.73
30994	30994	0.00	36.01
30833	30833	0.00	38.64
31093	31093	0.00	29.77
31080	31080	0.00	36.04

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Orange aroma**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 31190-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Orange aroma; Orange flavour

Special notes

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

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Orange aroma*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Orange aroma	13123307	31190	40	not required
Caelo	Orange aroma	13406108	31402	40	not required
Fagron	Orange aroma	13H23-B41-295530	31510	40	not required
Caelo	Orange aroma	163470	33100	40	20161221*

Validation samples

A total of 48 238 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 *Orange aroma*. These samples are listed above in the [calibration samples](#) section.
- 20 518 spectra from a total of 482 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

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

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Orange aroma	13H23-B41-295530	31510 [†]	20
Caelo	Orange aroma	162063	32331	40
Caelo	Orange aroma	173005	33881	40
Caelo	Orange aroma	180831	34076	40
Caelo	Orange aroma	182057	34224	40
Caelo	Orange aroma	183261	34323	40

- 23 128 spectra from a total of 572 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

*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*.

- 68 spectra from 38 *Apo-Ident* customers from 37 batches from the substance/substance group *Orange aroma*.

Supplier	Substance	Batch	Spectra
Caelo	Orange aroma	23051201	1
Caelo	Orange aroma	12216712	2
Caelo	Orange aroma	25031304	1
Sanacorp	Orange aroma	12356503	1
Caelo	Orange aroma	12356503	2
Caelo	Orange aroma	13123305	2
Caelo	Orange aroma	13123309	1
Caelo	Orange aroma	12356502	1
Caelo	Orange aroma	13330207	1
Caelo	Orange aroma	13406101	2
Caelo	Orange aroma	13330206	1
Caelo	Orange aroma	14150706	4
Caelo	Orange aroma	13406108	2
Caelo	Orange aroma	13406104	1
Caelo	Orange aroma	14150707	3
Caelo	Orange aroma	14150714	1
Caelo	Orange aroma	14150703	1
Caelo	Orange aroma	14352906	1
Caelo	Orange aroma	14352904	3
Caelo	Orange aroma	14352903	1
Fagron	Orange aroma	14352904	1
Caelo	Orange aroma		1
Caelo	Orange aroma	15215401	1
Caelo	Orange aroma	15215402	3
Caelo	Orange aroma	15215403	2
Caelo	Orange aroma	15215410	1
Caelo	Orange aroma	15215408	2
Audor Pharma	Orange aroma	15215409	1
Allergika/Kehr	Orange aroma	16056107	1
Caelo	Orange aroma	16056105	4
Caelo	Orange aroma	16056107	4
Caelo	Orange aroma	160566107	1
Caelo	Orange aroma	16056108	1
Caelo	Orange aroma	16347005	3
Caelo	Orange aroma	17055104	1
Fagron	Orange aroma	17A30-B02-335197	1
Caelo	Orange aroma	17300507	4
Caelo	Orange aroma	17055110	1
Caelo	Orange aroma	17300501	1
Caelo	Orange aroma	17300509	2

- 4144 spectra from 392 *Apo-Ident* customers from a total of 2074 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Orange aroma* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all

relevant spectra of the various substances were compared with *Orange aroma* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 518
Type B	0	220	0	23 128
Type C	0	67	1	4144

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9555 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9507 %)	100.0000 % (> 97.2727 %)
Type C	100.0000 % (> 98.5355 %)	98.5294 % (> 94.1176 %)

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

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

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

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
31190	31190	0.00	59.08
31510	31510	0.00	109.49
31402	31402	0.00	59.41
33100	33100	0.00	61.53

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Oregano oil**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 31554-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Oregano oil; Oleum origani cretici

Special notes

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

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Oregano oil*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Taoasis	Oregano oil	0131022-117999	31554	40	not required
Taoasis	Oregano oil	7921018-119483	31779	40	not required
Taoasis	Oregano oil	43878A-125814	32769	40	not required
Taoasis	Oregano oil	44314A-129096	33649	40	not required
Primavera	Oregano oil	00256M26	34368	40	not required

Validation samples

A total of 48 238 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 *Oregano oil*. These samples are listed above in the [calibration samples](#) section.
- 20 478 spectra from a total of 481 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 80 spectra of 3 reference samples from the substance/substance group *Oregano oil*.

Supplier	Substance	Batch	Sample ID	Spectra
Taoasis	Oregano oil	0131022-117999	31554 [†]	20
Taoasis	Oregano oil	7921018-119483	31779 [†]	20
Taoasis	Oregano oil	43878A-123201	32939	40

- 23 268 spectra from a total of 575 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

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

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

- 4212 spectra from 396 *Apo-Ident* customers from a total of 2111 batches from a further 135 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Oregano oil* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Oregano oil* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 478
Type B	0	80	0	23 268
Type C	0	0	0	4212

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9554 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9510 %)	100.0000 % (> 92.5000 %)
Type C	100.0000 % (> 98.5344 %)	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
34368	34368	0.00	69.34
32769	32769	0.00	49.08
33649	33649	0.00	51.95
31779	31779	0.00	139.83
31554	31554	0.00	96.32

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Palmarosa oil, organic**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 30597-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Palmarosa oil, organic; Oleum palmarosae

Special notes

When selecting the *Palmarosa oil, organic* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Palmarosa oil, organic*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Taoasis	Palmarosa oil, o...	2461021-121891	31828	40	not required
Taoasis	Palmarosa oil, o...	4941003-126708	33043	40	not required
Taoasis	Palmarosa oil, o...	2141-3447	34289	40	not required

Validation samples

A total of 48 238 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 *Palmarosa oil, organic*. These samples are listed above in the [calibration samples](#) section.
- 20 558 spectra from a total of 483 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 220 spectra of 6 reference samples from the substance/substance group *Palmarosa oil, organic*.

Supplier	Substance	Batch	Sample ID	Spectra
Taoasis	Palmarosa oil, organic	17524-105015BAG90451	30597	40
Taoasis	Palmarosa oil, organic	17524-105015BAG90451	30671	40
Taoasis	Palmarosa oil, organic	2461021-121891	31828 [†]	20
Taoasis	Palmarosa oil, organic	4941003-126708	33044	40
Taoasis	Palmarosa oil, organic	104704-129227	33856	40
Primavera	Palmarosa oil, organic	00500L26	34366	40

- 23 128 spectra from a total of 573 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 4 spectra from 3 *Apo-Ident* customers from 2 batches from the substance/substance group *Palmarosa oil, organic*.

[†]These spectra were recorded from 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
Taoasis	Palmarosa oil, organic	121018-111094	1
Taoasis	Palmarosa oil, organic	121018-111872	2
Taoasis/Taoasis	Palmarosa oil, organic	121018-111872	1

- 4208 spectra from 396 *Apo-Ident* customers from a total of 2109 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Palmarosa oil, organic* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Palmarosa oil, organic* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 558
Type B	0	220	0	23 128
Type C	0	4	0	4208

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9556 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9507 %)	100.0000 % (> 97.2727 %)
Type C	100.0000 % (> 98.5524 %)	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
33043	33043	0.00	123.77
31828	31828	0.00	137.52
34289	34289	0.00	140.53

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Panthenol ointment Lichtenstein**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 30727-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Panthenol ointment Lichtenstein

Special notes

When selecting the *Panthenol ointment Lichtenstein* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Panthenol ointment Lichtenstein*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Winthrop	Panthenol ointme...	2290680H	30727	40	not required
Winthrop	Panthenol ointme...	2290718H	31091	40	not required
Zentiva Pharm...	Panthenol ointme...	EH4594	31764	40	not required

Validation samples

A total of 48 238 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 *Panthenol ointment Lichtenstein*. These samples are listed above in the [calibration samples](#) section.
- 20 558 spectra from a total of 483 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 100 spectra of 3 reference samples from the substance/substance group *Panthenol ointment Lichtenstein*.

Supplier	Substance	Batch	Sample ID	Spectra
Zentiva Pharma GmbH	Panthenol ointment Lichtenst...	EH4594	31764 [†]	20
Zentiva Pharma GmbH	Panthenol ointment Lichtenst...	GC5567	33284	40
Zentiva Pharma GmbH	Panthenol ointment Lichtenst...	GD5661	33425	40

- 23 248 spectra from a total of 575 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 0 spectra from 0 *Apo-Ident* customers from 0 batches from the substance/substance group *Panthenol ointment Lichtenstein*.
- 4212 spectra from 396 *Apo-Ident* customers from a total of 2111 batches from a further 135 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented

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

within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Panthenol ointment Lichtenstein* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Panthenol ointment Lichtenstein* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 558
Type B	0	100	0	23 248
Type C	0	0	0	4212

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9556 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9509 %)	100.0000 % (> 94.0000 %)
Type C	100.0000 % (> 98.5344 %)	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
31764	31764	0.00	161.10
30727	30727	0.00	194.51
31091	31091	0.00	191.41

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Patchouli oil**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 31547-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Patchouli oil; Oleum pogostemon cablin

Special notes

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

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Patchouli oil*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Taoasis	Patchouli oil	130930-112789	31547	40	not required
Caelo	Patchouli oil	14167204	31619	40	not required
Taoasis	Patchouli oil	FFL735-123003	32172	40	not required

Validation samples

A total of 48 238 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 *Patchouli oil*. These samples are listed above in the [calibration samples](#) section.
- 20 558 spectra from a total of 483 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 200 spectra of 6 reference samples from the substance/substance group *Patchouli oil*.

Supplier	Substance	Batch	Sample ID	Spectra
Taoasis	Patchouli oil	130930-112789	31547 [†]	20
Caelo	Patchouli oil	14167204	31619 [†]	20
Taoasis	Patchouli oil	1633-126207	33031	40
Taoasis	Patchouli oil	1633-126207	33032	40
Taoasis	Patchouli oil	P29-1186	34113	40
Primavera	Patchouli oil	00475B27	34389	40

- 23 148 spectra from a total of 573 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 2 spectra from 1 *Apo-Ident* customers from 2 batches from the substance/substance group *Patchouli oil*.

[†]These spectra were recorded from 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
Taoasis	Patchouli oil	130930-116684	1
Taoasis	Patchouli oil	33474-119161	1

- 4210 spectra from 396 *Apo-Ident* customers from a total of 2109 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Patchouli oil* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Patchouli oil* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 558
Type B	0	96	104	23 148
Type C	0	1	1	4210

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9556 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9508 %)	48.0000 % (> 46.5000 %)
Type C	100.0000 % (> 98.5703 %)	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
32172	32172	0.00	37.17
31619	31619	0.00	35.23
31547	31547	0.00	23.37

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Peppermint oil**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 30930-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Peppermint oil; Oleum menthae piperitae dopp. rectific.

Special notes

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

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Peppermint oil*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Taoasis	Peppermint oil	443428-83579	30930	40	not required
Taoasis	Peppermint oil	525728-109217B	30965	40	not required
Taoasis	Peppermint oil	2016104277-125426	32481	40	not required
Primavera	Peppermint oil	00098J25	33809	40	not required

Validation samples

A total of 48 238 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 *Peppermint oil*. These samples are listed above in the [calibration samples](#) section.
- 20 518 spectra from a total of 482 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 200 spectra of 5 reference samples from the substance/substance group *Peppermint oil*.

Supplier	Substance	Batch	Sample ID	Spectra
Taoasis	Peppermint oil	2016104277-126375	32804	40
Taoasis	Peppermint oil	104277-126684	33030	40
Primavera	Peppermint oil	00374B26	33958	40
Primavera	Peppermint oil	00221G26	34168	40
Primavera	Peppermint oil	00465A27	34371	40

- 23 148 spectra from a total of 573 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 16 spectra from 9 *Apo-Ident* customers from 15 batches from the substance/substance group *Peppermint oil*.

Supplier	Substance	Batch	Spectra
Caelo	Peppermint oil	12114225	1

continued on the next page

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Supplier	Substance	Batch	Spectra
Taoasis	Peppermint oil	24699-117643	1
Fagron	Peppermint oil	15B11-B08-304117	1
Bombastus	Peppermint oil	286204	1
Taoasis/ Kehr	Peppermint oil	41798-120746H08	1
Taoasis	Peppermint oil	40076-120885	1
Taoasis	Peppermint oil	63561-126008	1
Taoasis	Peppermint oil	41798-121607	1
Taoasis	Peppermint oil	63561-125729	1
Taoasis	Peppermint oil	63561-125104	1
Taoasis	Peppermint oil	52216-123564	1
Taoasis/Kehr	Peppermint oil	127711	1
Toasis/Noweda	Peppermint oil		2
Caelo	Peppermint oil	16114611	1
Phoenix 28.12..18	Peppermint oil	18221702	1

- 4196 spectra from 396 *Apo-Ident* customers from a total of 2097 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Peppermint oil* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Peppermint oil* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 518
Type B	0	190	10	23 148
Type C	0	16	0	4196

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9555 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9508 %)	95.0000 % (> 93.5000 %)
Type C	100.0000 % (> 98.5389 %)	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
32481	32481	0.00	82.30
33809	33809	0.00	78.45
30930	30930	0.00	93.50
30965	30965	0.00	95.52

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group	Perfume oil vanilla
Substance class	APIs & excipients, liquid/semi-solid (other)
Report date	24/05/2019
Report number	30665-2019-05-24
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Perfume oil vanilla; Oleum vanillae planifoliae

Special notes

When selecting the *Perfume oil vanilla* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-6679-5	<i>European Pharmacopoeia 9th Edition, Basic Version 2017</i> [3]
Komm2.2.40	<i>Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident</i> [4]
AA004	<i>Erstellung und Validierung eines IdentModul-Updates</i>
Appendix F	Addition to the second-stage models

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Perfume oil vanilla*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Perfume oil vani...	10293212	30665	40	not required
Caelo	Perfume oil vani...	13393501	31191	40	1403100
Caelo	Perfume oil vani...	13393501	31400	40	not required
Caelo	Perfume oil vani...	14284107	31786	40	not required

Validation samples

A total of 48 238 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 *Perfume oil vanilla*. These samples are listed above in the [calibration samples](#) section.
- 20 518 spectra from a total of 483 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 100 spectra of 3 reference samples from the substance/substance group *Perfume oil vanilla*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Perfume oil vanilla	14284107	31786 [†]	20
Caelo	Perfume oil vanilla	15316308	33439	40
Caelo	Perfume oil vanilla	15316308	33440	40

- 23 248 spectra from a total of 576 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 13 spectra from 5 *Apo-Ident* customers from 2 batches from the substance/substance group *Perfume oil vanilla*.

[†]These spectra were recorded from 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	Perfume oil vanilla	15316308	12
Caelo	Perfume oil vanilla	17054404	1

- 4199 spectra from 396 *Apo-Ident* customers from a total of 2109 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Perfume oil vanilla* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Perfume oil vanilla* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 518
Type B	0	100	0	23 248
Type C	0	13	0	4199

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9555 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9509 %)	100.0000 % (> 94.0000 %)
Type C	100.0000 % (> 98.5400 %)	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
30665	30665	0.00	124.72
31191	31191	0.00	121.74
31400	31400	0.00	122.26
31786	31786	0.00	130.73

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Raspberry aroma**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 30562-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Raspberry aroma; Raspberry flavour

Special notes

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

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Raspberry aroma*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Raspberry aroma	12246612	31171	40	1402588
Caelo	Raspberry aroma	14115902	31396	40	not required
Caelo	Raspberry aroma	16126605	33222	40	not required

Validation samples

A total of 48 238 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 *Raspberry aroma*. These samples are listed above in the [calibration samples](#) section.
- 20 558 spectra from a total of 483 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 120 spectra of 3 reference samples from the substance/substance group *Raspberry aroma*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Raspberry aroma	12054307	30611	40
Caelo	Raspberry aroma	15438503	33054	40
Caelo	Raspberry aroma	172581	33697	40

- 23 228 spectra from a total of 575 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 91 spectra from 51 *Apo-Ident* customers from 43 batches from the substance/substance group *Raspberry aroma*.

Supplier	Substance	Batch	Spectra
Caelo	Raspberry aroma	12054311	1
Caelo	Raspberry aroma	11303813	1
Caelo	Raspberry aroma	12054310	1
Caelo	Raspberry aroma	12246608	2

continued on the next page

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Supplier	Substance	Batch	Spectra
Phönix Gotha	Raspberry aroma	12246612	1
Caelo	Raspberry aroma	12054302	1
Caelo	Raspberry aroma	12246604	1
Caelo	Raspberry aroma	12246616	1
Caelo	Raspberry aroma	12246612	1
Caelo	Raspberry aroma	12246617	1
Caelo	Raspberry aroma	13255502	2
Caelo	Raspberry aroma	13255514	2
Caelo	Raspberry aroma	13255507	2
Caelo	Raspberry aroma	14115902	1
Caelo	Raspberry aroma	13255510	1
Caelo	Raspberry aroma	14115909	1
Noweda	Raspberry aroma	14115909	1
Caelo	Raspberry aroma	14115913	2
Caesar/Noweda	Raspberry aroma	212m-07020	1
Caelo	Raspberry aroma	14115912	1
Caelo	Raspberry aroma	14376103	2
Caelo	Raspberry aroma	14376109	4
Caelo	Raspberry aroma	14376115	4
Caelo	Raspberry aroma	15219102	3
Caelo	Raspberry aroma	15438501	5
Rondell Apotheke	Raspberry aroma	15438501	1
Caelo	Raspberry aroma	15438503	6
Phönix	Raspberry aroma	15438506	1
Caelo	Raspberry aroma	16126605	4
Caelo	Raspberry aroma	16126602	3
Caelo	Raspberry aroma	16126606	2
Caelo	Raspberry aroma	16126609	3
Kehr	Raspberry aroma	16126609	1
Caelo	Raspberry aroma	16126611	1
Caelo	Raspberry aroma	17187202	4
Caelo	Raspberry aroma	17187205	1
Caelo	Raspberry aroma	17187201	1
Caelo	Raspberry aroma	17187212	6
Caelo	Raspberry aroma	17258103	1
Caelo	Raspberry aroma	17187213	1
Caelo	Raspberry aroma	17258101	2
Caelo	Raspberry aroma	17258102	3
Kehr	Raspberry aroma	17187209	1
Caelo	Raspberry aroma	17258107	2
Caelo	Raspberry aroma	17258106	2
Caelo	Raspberry aroma	18074307	1
Caelo	Raspberry aroma	18074302	1

- 4121 spectra from 387 *Apo-Ident* customers from a total of 2068 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Raspberry aroma* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Raspberry aroma* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following

table breaks down the numbers of correct and incorrect results according to 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	20 558
Type B	0	117	3	23 228
Type C	0	90	1	4121

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9556 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9508 %)	97.5000 % (> 95.0000 %)
Type C	100.0000 % (> 98.5352 %)	98.9011 % (> 95.6044 %)

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

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

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

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
31171	31171	0.00	65.63
31396	31396	0.00	69.86
33222	33222	0.00	76.44

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Ravensara (essential oil)**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 30386-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Ravensara (essential oil)

Special notes

When selecting the *Ravensara (essential oil)* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Ravensara (essential oil)*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Taoasis	Ravensara (essen...	231012-118739	31635	40	not required
Taoasis	Ravensara (essen...	1687-966	33854	40	not required
Taoasis	Ravensara (essen...	1687-966	33872	40	not required

Validation samples

A total of 48 238 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 *Ravensara (essential oil)*. These samples are listed above in the [calibration samples](#) section.
- 20 558 spectra from a total of 484 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 180 spectra of 5 reference samples from the substance/substance group *Ravensara (essential oil)*.

Supplier	Substance	Batch	Sample ID	Spectra
Taoasis	Ravensara (essential oil)	231012-118739	31635 [†]	20
Taoasis	Ravensara (essential oil)	1687-125316	32803	40
Taoasis	Ravensara (essential oil)	1687-125316	33029	40
Taoasis	Ravensara (essential oil)	1994-3103	34285	40
Primavera	Ravensara (essential oil)	00065B27	34403	40

- 23 168 spectra from a total of 574 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 13 spectra from 1 *Apo-Ident* customers from 8 batches from the substance/substance group *Ravensara (essential oil)*.

[†]These spectra were recorded from 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
Taoasis	Ravensara (essential oil)	2101005-116830	3
Taoasis	Ravensara (essential oil)	231012-118738	1
Taoasis	Ravensara (essential oil)	231012-118739	2
Taoasis	Ravensara (essential oil)	231012-118892	1
Taoasis	Ravensara (essential oil)	231012-119831	1
Taoasis	Ravensara (essential oil)	9331006-121650	3
Taoasis	Ravensara (essential oil)	231012-120291	1
Taoasis	Ravensara (essential oil)	1687-125316	1

- 4199 spectra from 396 *Apo-Ident* customers from a total of 2103 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Ravensara (essential oil)* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ravensara (essential oil)* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 558
Type B	0	180	0	23 168
Type C	0	13	0	4199

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9556 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9508 %)	100.0000 % (> 96.6667 %)
Type C	100.0000 % (> 98.5400 %)	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
31635	31635	0.00	23.11
33854	33854	0.00	26.06
33872	33872	0.00	24.73

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Rose-geranium oil, organic**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 30536-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Rose-geranium oil, organic; Oleum pelargonium graveolens

Special notes

When selecting the *Rose-geranium oil, organic* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Rose-geranium oil, organic*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Taoasis	Rose-geranium oi...	21027-119997	31698	40	not required
Taoasis	Rose-geranium oi...	21027-121893	31776	40	not required
Taoasis	Rose-geranium oi...	21027-121893	31951	40	not required
Taoasis	Rose-geranium oi...	1616008-125056	33036	40	not required

Validation samples

A total of 48 238 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 *Rose-geranium oil, organic*. These samples are listed above in the [calibration samples](#) section.
- 20 518 spectra from a total of 483 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 180 spectra of 6 reference samples from the substance/substance group *Rose-geranium oil, organic*.

Supplier	Substance	Batch	Sample ID	Spectra
Taoasis	Rose-geranium oil, organic	21027-119997	31698 [†]	20
Taoasis	Rose-geranium oil, organic	21027-121893	31776 [†]	20
Taoasis	Rose-geranium oil, organic	21027-121893	31951 [†]	20
Taoasis	Rose-geranium oil, organic	1616008-125056	33037	40
Taoasis	Rose-geranium oil, organic	2260-2430	34042	40
Primavera	Rose-geranium oil, organic	00492L26	34372	40

- 23 168 spectra from a total of 573 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 14 spectra from 8 *Apo-Ident* customers from 13 batches from the substance/substance group *Rose-geranium oil, organic*.

[†]These spectra were recorded from 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
Taoasis	Rose-geranium oil, organic	130111-110467	1
Bombastus	Rose-geranium oil, organic	22625-106677	1
Taoasis	Rose-geranium oil, organic	130729-113060	1
Primavera	Rose-geranium oil, organic	8304131	1
Taoasis	Rose-geranium oil, organic	130111-112615	1
Taoasis/Taoasis	Rose-geranium oil, organic	22625-104463	1
Taoasis	Rose-geranium oil, organic	401011-117641	1
Taoasis	Rose-geranium oil, organic	401011-117806	2
Taoasis	Rose-geranium oil, organic	21027-119121	1
Taoasis	Rose-geranium oil, organic	21027-121337	1
Taoasis	Rose-geranium oil, organic	21027-120292	1
Taoasis	Rose-geranium oil, organic	1500969-123554	1
Biofrid	Rose-geranium oil, organic	5010	1

- 4198 spectra from 396 *Apo-Ident* customers from a total of 2098 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Rose-geranium oil, organic* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Rose-geranium oil, organic* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 518
Type B	0	180	0	23 168
Type C	0	14	0	4198

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9555 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9508 %)	100.0000 % (> 96.6667 %)
Type C	100.0000 % (> 98.5396 %)	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
33036	33036	0.00	30.80
31698	31698	0.00	34.94
31776	31776	0.00	37.10
31951	31951	0.00	36.39

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Rosemary camphor oil**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 33803-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Rosemary camphor oil

Special notes

When selecting the *Rosemary camphor oil* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Rosemary camphor oil*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Primavera	Rosemary camphor...	00536K25	33803	40	not required
Primavera	Rosemary camphor...	00559B26	33959	40	not required

Validation samples

A total of 48 238 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 *Rosemary camphor oil*. These samples are listed above in the [calibration samples](#) section.
- 20 598 spectra from a total of 484 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 80 spectra of 2 reference samples from the substance/substance group *Rosemary camphor oil*.

Supplier	Substance	Batch	Sample ID	Spectra
Primavera	Rosemary camphor oil	00179G26	34170	40
Primavera	Rosemary camphor oil	00631A27	34373	40

- 23 268 spectra from a total of 576 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 0 spectra from 0 *Apo-Ident* customers from 0 batches from the substance/substance group *Rosemary camphor oil*.
- 4212 spectra from 396 *Apo-Ident* customers from a total of 2111 batches from a further 135 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Rosemary camphor oil* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Rosemary camphor oil* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 598
Type B	0	80	0	23 268
Type C	0	0	0	4212

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9558 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9510 %)	100.0000 % (> 92.5000 %)
Type C	100.0000 % (> 98.5344 %)	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
33803	33803	0.00	20.47
33959	33959	0.00	20.30

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Rosewood oil**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 31556-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Rosewood oil; Oleum aniba roseodora

Special notes

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

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Rosewood oil*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Taoasis	Rosewood oil	11572-116545	31556	40	not required
Taoasis	Rosewood oil	4381004-120355	31688	40	not required
Taoasis	Rosewood oil	42543-2657	34106	40	not required

Validation samples

A total of 48 238 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 *Rosewood oil*. These samples are listed above in the [calibration samples](#) section.
- 20 558 spectra from a total of 483 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 160 spectra of 5 reference samples from the substance/substance group *Rosewood oil*.

Supplier	Substance	Batch	Sample ID	Spectra
Taoasis	Rosewood oil	11572-116545	31556 [†]	20
Taoasis	Rosewood oil	4381004-120355	31688 [†]	20
Taoasis	Rosewood oil	5101015-124967	32801	40
Taoasis	Rosewood oil	5101015-124967	33048	40
Primavera	Rosewood oil	00632H26	34381	40

- 23 188 spectra from a total of 574 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 11 spectra from 1 *Apo-Ident* customers from 7 batches from the substance/substance group *Rosewood oil*.

[†]These spectra were recorded from 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
Taoasis	Rosewood oil	4381004-1200355	1
Taoasis	Rosewood oil	4381004-122041	2
Taoasis	Rosewood oil	4381004-121143	2
Taoasis	Rosewood oil	5101017-122566	2
Taoasis	Rosewood oil	5101015-123299	1
Taoasis	Rosewood oil	5101015-124243	1
Taoasis	Rosewood oil	5101015-124967	2

- 4201 spectra from 396 *Apo-Ident* customers from a total of 2104 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Rosewood oil* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Rosewood oil* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 558
Type B	0	160	0	23 170
Type C	0	11	0	4201

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9556 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9515 %)	100.0000 % (> 96.2500 %)
Type C	100.0000 % (> 98.5410 %)	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
31556	31556	0.00	45.53
31688	31688	0.00	51.64
34106	34106	0.00	40.77

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Sage oil**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 31139-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Sage oil; Oleum salviae

Special notes

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

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Sage oil*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Taoasis	Sage oil	526975-112642BAG90451	31139	40	not required
Taoasis	Sage oil	34052-114939	31257	40	not required
Taoasis	Sage oil	8461016-122272	31783	40	not required

Validation samples

A total of 48 238 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 *Sage oil*. These samples are listed above in the [calibration samples](#) section.
- 20 558 spectra from a total of 483 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 100 spectra of 3 reference samples from the substance/substance group *Sage oil*.

Supplier	Substance	Batch	Sample ID	Spectra
Taoasis	Sage oil	8461016-122272	31783 [†]	20
Taoasis	Sage oil	8461016-126496	33034	40
Taoasis	Sage oil	8461016-126496	33035	40

- 23 248 spectra from a total of 576 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 5 spectra from 1 *Apo-Ident* customers from 5 batches from the substance/substance group *Sage oil*.

Supplier	Substance	Batch	Spectra
Taoasis	Sage oil	21190-118009	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
Taoasis	Sage oil	13988-117449	1
Taoasis	Sage oil	21190-119239	1
Taoasis	Sage oil	29944-120889	1
Taoasis	Sage oil	29944-120965	1

- 4207 spectra from 396 *Apo-Ident* customers from a total of 2106 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Sage oil* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Sage oil* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 558
Type B	0	100	0	23 248
Type C	0	5	0	4207

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9556 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9509 %)	100.0000 % (> 94.0000 %)
Type C	100.0000 % (> 98.5488 %)	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
31257	31257	0.00	34.43
31139	31139	0.00	35.28
31783	31783	0.00	31.11

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Salicylic white paraffin 10%**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 31521-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Salicylic white paraffin 10%; Acidum salicylicum cum vaselino albo 10 %

Special notes

When selecting the *Salicylic white paraffin 10%* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan 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 white paraffin 10%*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Bombastus	Salicylic white ...	287820	31521	40	not required
Bombastus	Salicylic white ...	291886	31629	55	not required
Bombastus	Salicylic white ...	310227	33473	40	not required

Validation samples

A total of 48 238 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 *Salicylic white paraffin 10%*. These samples are listed above in the [calibration samples](#) section.
- 20 543 spectra from a total of 483 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 120 spectra of 4 reference samples from the substance/substance group *Salicylic white paraffin 10%*.

Supplier	Substance	Batch	Sample ID	Spectra
Bombastus	Salicylic white paraffin 10%	287820	31521 [†]	20
Bombastus	Salicylic white paraffin 10%	291886	31629 [†]	20
Bombastus	Salicylic white paraffin 10%	302737	32741	40
Bombastus	Salicylic white paraffin 10%	309004	33416	40

- 23 228 spectra from a total of 574 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 7 spectra from 5 *Apo-Ident* customers from 6 batches from the substance/substance group *Salicylic white paraffin 10%*.

[†]These spectra were recorded from 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
Bombastus	Salicylic white paraffin 10%	293212	1
Eigenrezeptur	Salicylic white paraffin 10%	150702	1
Caelo	Salicylic white paraffin 10%	16120701	2
Caelo	Salicylic white paraffin 10%	16214203	1
Caelo	Salicylic white paraffin 10%	15394702	1
Caelo	Salicylic white paraffin 10%	16214202	1

- 4205 spectra from 395 *Apo-Ident* customers from a total of 2105 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance 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 white paraffin 10%* can clearly be 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 white paraffin 10%* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 543
Type B	0	120	0	23 228
Type C	0	6	1	4205

The substance/substance group *Salicylic white paraffin 10%* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9555 %)	100.0000 % (> 95.5556 %)
Type B	100.0000 % (> 99.9508 %)	100.0000 % (> 95.0000 %)
Type C	100.0000 % (> 98.5447 %)	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
31521	31521	0.00	65.33
31629	31629	0.00	65.11
33473	33473	0.00	65.35

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Salmon oil**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 33088-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Salmon oil

Special notes

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

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Salmon oil*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Salmon oil	170345	33088	40	20170213*
Caelo	Salmon oil	173079	34225	40	20171116*

Validation samples

A total of 48 238 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 *Salmon oil*. These samples are listed above in the [calibration samples](#) section.
- 20 598 spectra from a total of 484 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 40 spectra of 1 reference samples from the substance/substance group *Salmon oil*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Salmon oil	182524	34341	40

- 23 308 spectra from a total of 577 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 0 spectra from 0 *Apo-Ident* customers from 0 batches from the substance/substance group *Salmon oil*.
- 4212 spectra from 396 *Apo-Ident* customers from a total of 2111 batches from a further 135 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

*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.

Validation results

The validation runs checked whether the substance/substance group *Salmon oil* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Salmon oil* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 598
Type B	0	40	0	23 308
Type C	0	0	0	4212

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9558 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9513 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 98.5344 %)	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
33088	33088	0.00	45.80
34225	34225	0.00	51.89

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Sandalwood oil**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 33799-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Sandalwood oil

Special notes

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

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Sandalwood oil*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Primavera	Sandalwood oil	00891G25	33799	40	not required
Primavera	Sandalwood oil	00141L25	33801	40	not required
Taoasis	Sandalwood oil	145-505	33832	40	not required

Validation samples

A total of 48 238 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 *Sandalwood oil*. These samples are listed above in the [calibration samples](#) section.
- 20 558 spectra from a total of 483 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 120 spectra of 3 reference samples from the substance/substance group *Sandalwood oil*.

Supplier	Substance	Batch	Sample ID	Spectra
Taoasis	Sandalwood oil	128319	33833	40
Primavera	Sandalwood oil	00474C26	34173	40
Primavera	Sandalwood oil	00346L26	34408	40

- 23 228 spectra from a total of 575 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 0 spectra from 0 *Apo-Ident* customers from 0 batches from the substance/substance group *Sandalwood oil*.
- 4212 spectra from 396 *Apo-Ident* customers from a total of 2111 batches from a further 135 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Sandalwood oil* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Sandalwood oil* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 558
Type B	0	120	0	23 228
Type C	0	0	0	4212

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9556 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9508 %)	100.0000 % (> 95.0000 %)
Type C	100.0000 % (> 98.5344 %)	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
33799	33799	0.00	129.59
33832	33832	0.00	130.41
33801	33801	0.00	139.89

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Savory herb**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 33820-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Savory herb

Special notes

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

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Savory herb*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Taoasis	Savory herb	498	33820	40	not required
Taoasis	Savory herb	1569-129318	33821	40	not required

Validation samples

A total of 48 238 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 *Savory herb*. These samples are listed above in the [calibration samples](#) section.
- 20 598 spectra from a total of 484 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 40 spectra of 1 reference samples from the substance/substance group *Savory herb*.

Supplier	Substance	Batch	Sample ID	Spectra
Taoasis	Savory herb	1742-3729	34281	40

- 23 308 spectra from a total of 577 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 0 spectra from 0 *Apo-Ident* customers from 0 batches from the substance/substance group *Savory herb*.
- 4212 spectra from 396 *Apo-Ident* customers from a total of 2111 batches from a further 135 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Savory herb* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Savory herb* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 598
Type B	0	40	0	23 308
Type C	0	0	0	4212

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9558 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9513 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 98.5344 %)	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
33820	33820	0.00	27.57
33821	33821	0.00	24.91

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Sebexol® formula basis / Sebexol® cream lotion / ...**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 30839-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Sebexol® formula basis / Sebexol® cream lotion / Wofacutan washing lotion / Hans Karrer Hydrocream MicroSilver; Hans Karrer Hydrocream MicroSilver; Sebexol® basic pH 5 formula basis; Sebexol® cream lotion pH 5; Wofacutan wash lotion

Special notes

When selecting the *Sebexol® formula basis / Sebexol® cream lotion / Wofacutan washing lotion / Hans Karrer Hydrocream MicroSilver* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Sebexol® formula basis / Sebexol® cream lotion / Wofacutan washing lotion / Hans Karrer Hydrocream MicroSilver*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Devesa	Sebexol® cream l...	1220	30839	40	1403097

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Kesla Pharma	Wofacutan wash l...	0974.12	30972	80	not required
Kesla Pharma	Wofacutan wash l...	0389.13	31065	40	not required
Devesa	Sebexol [®] cream l...	1317	31103	40	not required
Devesa	Sebexol [®] basic p...	1307	31104	40	1403098
Devesa	Sebexol [®] cream l...	1412	31592	30	not required
Devesa	Sebexol [®] cream l...	1531	31839	40	not required
Devesa	Sebexol [®] basic p...	1522	31961	40	not required
Devesa	Sebexol [®] cream l...	1552.2	32743	40	not required
Devesa	Sebexol [®] basic p...	1638124	32744	40	not required
Hans Karrer G...	Hans Karrer Hydr...	16001	33190	40	not required
Hans Karrer G...	Hans Karrer Hydr...	16002	33191	40	not required
Kesla Pharma	Wofacutan wash l...	0868.16	33483	40	not required
Hans Karrer G...	Hans Karrer Hydr...	18002	34116	40	not required

Validation samples

A total of 48 238 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 590 spectra of 14 reference samples from the substance/substance group *Sebexol[®] formula basis / Sebexol[®] cream lotion / Wofacutan washing lotion / Hans Karrer Hydrocream MicroSilver*. These samples are listed above in the [calibration samples](#) section.
- 20 088 spectra from a total of 473 batches from further 155 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 375 spectra of 11 reference samples from the substance/substance group *Sebexol[®] formula basis / Sebexol[®] cream lotion / Wofacutan washing lotion / Hans Karrer Hydrocream MicroSilver*.

Supplier	Substance	Batch	Sample ID	Spectra
Devesa	Sebexol [®] cream lotion pH 5	1412	31592 [†]	15
Devesa	Sebexol [®] cream lotion pH 5	1531	31839 [†]	20
Devesa	Sebexol [®] basic pH 5 formula ...	1522	31961 [†]	20
Devesa	Sebexol [®] cream lotion pH 5	1605101	32907	40
Devesa	Sebexol [®] cream lotion pH 5	1605101	32908	40
Kesla Pharma	Wofacutan wash lotion	0729.16	32913	40
Kesla Pharma	Wofacutan wash lotion	0729.16	32914	40
Hans Karrer GmbH	Hans Karrer Hydrocream Micro...	16003	33192	40
Hans Karrer GmbH	Hans Karrer Hydrocream Micro...	16004	33193	40
Devesa	Sebexol [®] basic pH 5 formula ...	1712122	33427	40
Devesa	Sebexol [®] basic pH 5 formula ...	1644102	33432	40

- 22 973 spectra from a total of 569 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 333 spectra from 64 *Apo-Ident* customers from 102 batches from the substance/substance group *Sebexol® formula basis* / *Sebexol® cream lotion* / *Wofacutan washing lotion* / *Hans Karrer Hydrocream MicroSilver*.

Supplier	Substance	Batch	Spectra
Dr.Reingraber GmbH	Sebexol® basic pH 5 formula ...	1232	1
Caelo	Sebexol® basic pH 5 formula ...	1239	1
Devesa	Sebexol® basic pH 5 formula ...	1307	1
Devesa	Sebexol® basic pH 5 formula ...	1232	1
Devesa/AHD	Sebexol® basic pH 5 formula ...	1245	4
Devesa	Sebexol® basic pH 5 formula ...	1307	5
Devesa	Sebexol® basic pH 5 formula ...	1232	1
Devesa	Sebexol® basic pH 5 formula ...	1239	1
Phönix	Sebexol® basic pH 5 formula ...	1313	2
Devesa	Sebexol® basic pH 5 formula ...		3
Caelo	Sebexol® basic pH 5 formula ...	1131	2
Ichthyol	Sebexol® basic pH 5 formula ...	1232	2
Devesa Dr.Reingraber Gm...	Sebexol® basic pH 5 formula ...	1244	1
Devesa/Gehe	Sebexol® basic pH 5 formula ...		1
Sebexol/AHD	Sebexol® basic pH 5 formula ...	1303	2
DEVESA	Sebexol® basic pH 5 formula ...	1318	2
Sanacorp	Sebexol® basic pH 5 formula ...	1313	1
Devesa Dr.Reingraber Gm...	Sebexol® basic pH 5 formula ...	1303	1
Sebexol	Sebexol® basic pH 5 formula ...	1313	1
Sebexol	Sebexol® basic pH 5 formula ...	1333	1
Phoenix/Devesa	Sebexol® basic pH 5 formula ...	1215	1
Devesa	Sebexol® basic pH 5 formula ...	1328	5
Bombastus	Sebexol® basic pH 5 formula ...	1346	2
Eigenherstellung	Sebexol® basic pH 5 formula ...	1328	1
Devesa/AHD	Sebexol® basic pH 5 formula ...	1328	7
Noweda	Sebexol® basic pH 5 formula ...	1328	1
Devesa/ Fiebig	Sebexol® basic pH 5 formula ...	1338	1
devesa/gehe	Sebexol® basic pH 5 formula ...	1346	1
Holdermann	Sebexol® basic pH 5 formula ...	1307	1
Devesa	Sebexol® basic pH 5 formula ...	1335	2
Phoenix/Devesa	Sebexol® basic pH 5 formula ...	1407	1
Devesa	Sebexol® basic pH 5 formula ...	1404	1
DEVESA	Sebexol® basic pH 5 formula ...	1328	2
Devesa	Sebexol® basic pH 5 formula ...	1407	2
Sebexol/ Noweda	Sebexol® basic pH 5 formula ...	1403	1
devesa/gehe	Sebexol® basic pH 5 formula ...	1356	1
Phönix	Sebexol® basic pH 5 formula ...	1416	1
Noweda/Devesa	Sebexol® basic pH 5 formula ...	2x1407	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
DEVESA Dr.Reingraber GmbH	Sebexol [®] basic pH 5 formula ...	1328	1
Devesa/Kehr	Sebexol [®] basic pH 5 formula ...	1407	2
Devesa Dr.Reingraber GmbH	Sebexol [®] basic pH 5 formula ...	1425	1
Devesa/Noweda	Sebexol [®] basic pH 5 formula ...	1430	1
Phönix	Sebexol [®] basic pH 5 formula ...	1425	2
Fagron	Sebexol [®] basic pH 5 formula ...	1425	1
Sebexol/ Noweda	Sebexol [®] basic pH 5 formula ...	1430	1
Devesa	Sebexol [®] basic pH 5 formula ...	1430	1
Phoenix	Sebexol [®] basic pH 5 formula ...	1440	1
Devesa	Sebexol [®] basic pH 5 formula ...	1440	4
Devesa	Sebexol [®] basic pH 5 formula ...	1511	2
DEVESA	Sebexol [®] basic pH 5 formula ...	1440	2
DEVESA	Sebexol [®] basic pH 5 formula ...	1511	1
Fiebig	Sebexol [®] basic pH 5 formula ...	1511	3
Caelo	Sebexol [®] basic pH 5 formula ...	1440	1
Fagron	Sebexol [®] basic pH 5 formula ...	1510	2
Devesa/Sanacorp	Sebexol [®] basic pH 5 formula ...	1440	1
Devesa	Sebexol [®] basic pH 5 formula ...	1522	3
Devesa/Sanacorp	Sebexol [®] basic pH 5 formula ...	1522	1
Devesa/Sanacorp	Sebexol [®] basic pH 5 formula ...	1543	4
Devesa	Sebexol [®] basic pH 5 formula ...	1543	5
Devesa/Phönix	Sebexol [®] basic pH 5 formula ...	1543	2
Devesa	Sebexol [®] basic pH 5 formula ...	1604127	4
Caelo	Sebexol [®] basic pH 5 formula ...	1604127	2
Devesa/ Phoenix	Sebexol [®] basic pH 5 formula ...	1543	1
Devesa/Sanacorp	Sebexol [®] basic pH 5 formula ...	1620117	1
Dr Reinhard GmbH- Kehr	Sebexol [®] basic pH 5 formula ...	1620117	1
Caelo	Sebexol [®] basic pH 5 formula ...	1620117	2
Devesa/Sanacorp	Sebexol [®] basic pH 5 formula ...	1638124	1
Devesa/Phönix	Sebexol [®] basic pH 5 formula ...	1620117	2
Devesa	Sebexol [®] basic pH 5 formula ...	1620117	1
Devesa- Phönix	Sebexol [®] basic pH 5 formula ...	1604127	1
Devesa	Sebexol [®] basic pH 5 formula ...	1683124	1
Devesa	Sebexol [®] basic pH 5 formula ...	1638124	2
Devesa/Kehr	Sebexol [®] basic pH 5 formula ...	1620117	1
Devesa / Noweda	Sebexol [®] basic pH 5 formula ...	1620117	1
Phoenix/Devesa	Sebexol [®] basic pH 5 formula ...	1604127	1
Kehr/ Devesa	Sebexol [®] basic pH 5 formula ...	1644102	1
Devesa/Sanacorp	Sebexol [®] basic pH 5 formula ...	1644102	2
DEVESA/Noweda	Sebexol [®] basic pH 5 formula ...	1543	1
Devesa / Noweda	Sebexol [®] basic pH 5 formula ...	170420S/1620117	1
Devesa / Kehr	Sebexol [®] basic pH 5 formula ...	1644102	1
Devesa/Noweda	Sebexol [®] basic pH 5 formula ...	1604127	1
Devesa/Noweda	Sebexol [®] basic pH 5 formula ...	1638124	1
Devesa / Noweda	Sebexol [®] basic pH 5 formula ...	170516S/1644102	1
Devesa	Sebexol [®] basic pH 5 formula ...	1644102	3
Devesa/Phönix	Sebexol [®] basic pH 5 formula ...	1712122	2
Devesa	Sebexol [®] basic pH 5 formula ...	1712122	2
Devesa/Sanacorp	Sebexol [®] basic pH 5 formula ...	1712122	1
Phönix / Devesa	Sebexol [®] basic pH 5 formula ...	1644102	1
DEVESA / Noweda	Sebexol [®] basic pH 5 formula ...	1712122	3
Devesa/Sanacorp	Sebexol [®] basic pH 5 formula ...	1719111	1
devesa	Sebexol [®] basic pH 5 formula ...	1719111	3
Devesa/Noweda	Sebexol [®] basic pH 5 formula ...	1719111/05	1
Devesa	Sebexol [®] basic pH 5 formula ...	1719111	2
Dr. Reingraber GmbH	Sebexol [®] basic pH 5 formula ...	1708120	1
Kehr/ Devesa	Sebexol [®] basic pH 5 formula ...	1746116	4
Noweda / Dewesa	Sebexol [®] basic pH 5 formula ...	1719111	1
Devesa/Noweda	Sebexol [®] basic pH 5 formula ...	1807113	1
Kehr/Devesa	Sebexol [®] basic pH 5 formula ...	1817126	2

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Supplier	Substance	Batch	Spectra
Kehr/Devesa	Sebexol [®] basic pH 5 formula ...	1828110	2
Devesa/ Ebert	Sebexol [®] basic pH 5 formula ...	1817126	1
Astellas	Sebexol [®] cream lotion pH 5	1504	2
Devesa/NOW	Sebexol [®] cream lotion pH 5	1504/01	1
Devesa/Noweda	Sebexol [®] cream lotion pH 5	1447	3
Devesa	Sebexol [®] cream lotion pH 5	1510	4
Devesa/NOW	Sebexol [®] cream lotion pH 5	1504	2
Caelo	Sebexol [®] cream lotion pH 5	1504	1
DEVESA	Sebexol [®] cream lotion pH 5	1505	1
Devesa/Fiebig	Sebexol [®] cream lotion pH 5	1426	1
DEVESA	Sebexol [®] cream lotion pH 5	1510	1
Devesa/Phoenix	Sebexol [®] cream lotion pH 5	1511	1
Devesa /	Sebexol [®] cream lotion pH 5	1511	1
Caelo	Sebexol [®] cream lotion pH 5	1511	2
Devesa / Gehe	Sebexol [®] cream lotion pH 5	1517	1
Caelo	Sebexol [®] cream lotion pH 5	1417	1
Caelo	Sebexol [®] cream lotion pH 5	1430	1
DEVESA	Sebexol [®] cream lotion pH 5	1523	1
Devesa/NOW	Sebexol [®] cream lotion pH 5	1523	1
Devesa/Gehe	Sebexol [®] cream lotion pH 5	1504	1
Devesa	Sebexol [®] cream lotion pH 5	1523	3
Fagron	Sebexol [®] cream lotion pH 5	1517	1
Rondell Apotheke	Sebexol [®] cream lotion pH 5	1523	1
Devesa/Sanacorp	Sebexol [®] cream lotion pH 5	1530	2
Caelo	Sebexol [®] cream lotion pH 5	1531	1
Devesa/ Phönix	Sebexol [®] cream lotion pH 5	1524	1
Devesa / Gehe	Sebexol [®] cream lotion pH 5	1530	2
Devesa / Noweda	Sebexol [®] cream lotion pH 5	1531	1
Devesa / Gehe	Sebexol [®] cream lotion pH 5		1
DEVESA	Sebexol [®] cream lotion pH 5	1531	1
Devesa/NOW	Sebexol [®] cream lotion pH 5	1552	1
Caelo	Sebexol [®] cream lotion pH 5		2
Devesa/fiebig	Sebexol [®] cream lotion pH 5		1
Devesa/NOW	Sebexol [®] cream lotion pH 5		1
Dr. Wolff	Sebexol [®] cream lotion pH 5		1
Phönix	Sebexol [®] cream lotion pH 5	1604129	1
Devesea	Sebexol [®] cream lotion pH 5	1604128	1
Devesa/NOW	Sebexol [®] cream lotion pH 5	1604228	1
Devesa/Noweda	Sebexol [®] cream lotion pH 5		1
sanacorp, 27.9.16,4,312EUR	Sebexol [®] cream lotion pH 5	1604328	1
Devesa/NOW	Sebexol [®] cream lotion pH 5	1604129	1
DEVESA / Anzag	Sebexol [®] cream lotion pH 5	1605101	1
Devesa/Noweda	Sebexol [®] cream lotion pH 5	1605201	3
Devesa/NOW	Sebexol [®] cream lotion pH 5	1644102	1
Devesa/ Phoenix	Sebexol [®] cream lotion pH 5	1620117	1
Devesa / Gehe	Sebexol [®] cream lotion pH 5	1651120	1
Devesa	Sebexol [®] cream lotion pH 5	1417N-03872	1
Devesa	Sebexol [®] cream lotion pH 5	1708120	3
Devesa/Noweda	Sebexol [®] cream lotion pH 5	1651120	1
Dr. Reingraber GmbH	Sebexol [®] cream lotion pH 5	1605103	1
Phönix/Devesa	Sebexol [®] cream lotion pH 5	1712123	1
Devesa	Sebexol [®] cream lotion pH 5	1651121	1
Noweda	Sebexol [®] cream lotion pH 5	1651120	1
Devesa/Sanacorp WE: 09...	Sebexol [®] cream lotion pH 5	1651121	1
Devesa/Fiebig	Sebexol [®] cream lotion pH 5	1712123	2
Devesa/Noweda	Sebexol [®] cream lotion pH 5	1712123	1
Caelo	Sebexol [®] cream lotion pH 5	1712223	1
Noweda	Sebexol [®] cream lotion pH 5	1708120	1
Devesa GmbH /Alliance H...	Sebexol [®] cream lotion pH 5	1712223	1
Noweda	Sebexol [®] cream lotion pH 5	1712223	1

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Supplier	Substance	Batch	Spectra
THC Pharma	Sebexol [®] cream lotion pH 5	1727107	1
Devesa	Sebexol [®] cream lotion pH 5	1727107	1
Caelo	Sebexol [®] cream lotion pH 5	4117E-03872	1
Phönix	Sebexol [®] cream lotion pH 5	4217A-03872	1
Devesa/ Noweda	Sebexol [®] cream lotion pH 5	1736105	1
Devesa/Fiebig	Sebexol [®] cream lotion pH 5	1736105	5
Devesa / Gehe	Sebexol [®] cream lotion pH 5	1727107	1
devesa/Phönix	Sebexol [®] cream lotion pH 5	1727107	1
Devesa/Noweda	Sebexol [®] cream lotion pH 5	1736105	1
Devesa/Noweda	Sebexol [®] cream lotion pH 5	1736106	1
Devesa/ Phönix	Sebexol [®] cream lotion pH 5	1727207	1
Phönix/Devesa	Sebexol [®] cream lotion pH 5	1651121	1
Devesa/ Phönix	Sebexol [®] cream lotion pH 5	1736105	2
Devesa/ Phönix	Sebexol [®] cream lotion pH 5	1736106	6
Devesa / Gehe	Sebexol [®] cream lotion pH 5	1736106	2
Devesa/Sanacorp	Sebexol [®] cream lotion pH 5	1743125	1
Devesa/ Phönix	Sebexol [®] cream lotion pH 5	1743225	2
Devesa-Fa.Gehe	Sebexol [®] cream lotion pH 5	1727207/-20180112Ma9	1
devesa/Phönix	Sebexol [®] cream lotion pH 5	1743125	5
Devesa/Noweda	Sebexol [®] cream lotion pH 5	1743225	1
Devesa/Gehe	Sebexol [®] cream lotion pH 5	1651121	1
devesa/Phönix	Sebexol [®] cream lotion pH 5	1746116	8
Noweda/Devesa	Sebexol [®] cream lotion pH 5	1638124	1
Devesa / Gehe	Sebexol [®] cream lotion pH 5	1746116	2
devesa/Phönix	Sebexol [®] cream lotion pH 5	1802208	5
Devesa / Gehe 15.3.18	Sebexol [®] cream lotion pH 5	1743225-20180404Ma10	1
Devesa	Sebexol [®] cream lotion pH 5	1802108/01	1
Devesa /Phönix	Sebexol [®] cream lotion pH 5	1807113	8
Phoenix/Devesa	Sebexol [®] cream lotion pH 5	1812123	1
DEVEsa / Anzag	Sebexol [®] cream lotion pH 5	1802208	1
Devesa/ Phönix	Sebexol [®] cream lotion pH 5	1812223	3
Devesa/ Noweda	Sebexol [®] cream lotion pH 5	1802208	1
Devesa	Sebexol [®] cream lotion pH 5	1604328	1
Caelo	Sebexol [®] cream lotion pH 5	1807113	1
Devesa / Phönix	Sebexol [®] cream lotion pH 5	1812123	1
Phönix/Devesa	Sebexol [®] cream lotion pH 5	1824115	3
Phönix/Devesa	Sebexol [®] cream lotion pH 5	1817227	1
Devesa	Sebexol [®] cream lotion pH 5	1817127	1
Devesa/Fiebig	Sebexol [®] cream lotion pH 5	1817127	1
Devesa/Fiebig	Sebexol [®] cream lotion pH 5	1824115	1
Devesa/Phönix	Sebexol [®] cream lotion pH 5	1824215	1
Devesa-Fa.Gehe	Sebexol [®] cream lotion pH 5	1824215-S20181115Ma2	1
devesa/Phönix	Sebexol [®] cream lotion pH 5	18201402	1
Devesa / Gehe 08.12.18	Sebexol [®] cream lotion pH 5	1824215-S20190115Ma7	1
Phönix Gotha	Wofacutan wash lotion	97913	1
Hans Karrer / Anzag	Hans Karrer Hydrocream Micro...	18002	1
hanskarrer / Gehe	Hans Karrer Hydrocream Micro...	18001	1
Hanskarrer / Gehe	Hans Karrer Hydrocream Micro...	18002	1

- 3879 spectra from 393 *Apo-Ident* customers from a total of 2009 batches from a further 131 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	590	0	20 088
Type B	0	375	0	22 973
Type C	0	328	5	3879

The substance/substance group *Sebexol[®] formula basis / Sebexol[®] cream lotion / Wofacutan washing lotion / Hans Karrer Hydrocream MicroSilver* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9552 %)	100.0000 % (> 98.9831 %)
Type B	100.0000 % (> 99.9507 %)	100.0000 % (> 98.4000 %)
Type C	100.0000 % (> 98.5347 %)	98.4985 % (> 97.5976 %)

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

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

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

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
30972	30972	0.00	24.19
31065	31065	0.00	25.39
33483	33483	0.00	24.73
33190	33190	0.00	21.46
33191	33191	0.00	20.04
34116	34116	0.00	18.81
30839	30839	0.00	22.12
31592	31592	0.00	20.55
32743	32743	0.00	21.34
32744	32744	0.00	17.47
31103	31103	0.00	22.06
31839	31839	0.00	18.45
31104	31104	0.00	19.77
31961	31961	0.00	17.56

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Siam benzoin**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 31490-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Siam benzoin

Special notes

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

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Siam benzoin*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Primavera	Siam benzoin	3602151	31490	40	not required
Primavera	Siam benzoin	00051M23	31844	40	not required
Primavera	Siam benzoin	00074M26	34388	40	not required

Validation samples

A total of 48 238 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 *Siam benzoin*. These samples are listed above in the [calibration samples](#) section.
- 20 558 spectra from a total of 483 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

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

Supplier	Substance	Batch	Sample ID	Spectra
Primavera	Siam benzoin	3602151	31490 [†]	20
Primavera	Siam benzoin	00051M23	31844 [†]	20
Primavera	Siam benzoin	00218C24	32184	40
Primavera	Siam benzoin	00606B26	34171	40

- 23 228 spectra from a total of 574 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 0 spectra from 0 *Apo-Ident* customers from 0 batches from the substance/substance group *Siam benzoin*.
- 4212 spectra from 396 *Apo-Ident* customers from a total of 2111 batches from a further 135 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented

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

within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Siam benzoin* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Siam benzoin* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 558
Type B	0	120	0	23 228
Type C	0	0	0	4212

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9556 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9508 %)	100.0000 % (> 95.0000 %)
Type C	100.0000 % (> 98.5344 %)	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
31490	31490	0.00	102.55
31844	31844	0.00	193.34
34388	34388	0.00	224.75

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Solutio Cordes®**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 30996-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Solutio Cordes®

Special notes

When selecting the *Solutio Cordes®* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Solutio Cordes®*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Ichthyol	Solutio Cordes®	12B006	30996	40	not required
Ichthyol	Solutio Cordes®	13B001	31076	40	not required

Validation samples

A total of 48 238 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 *Solutio Cordes*[®]. These samples are listed above in the [calibration samples](#) section.
- 20 598 spectra from a total of 484 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 140 spectra of 3 reference samples from the substance/substance group *Solutio Cordes*[®].

Supplier	Substance	Batch	Sample ID	Spectra
Ichthyol	Solutio Cordes [®]	15B005	32065	60
Ichthyol	Solutio Cordes [®]	15B005	32483	40
Ichthyol	Solutio Cordes [®]	17B007	34361	40

- 23 208 spectra from a total of 576 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 44 spectra from 14 *Apo-Ident* customers from 14 batches from the substance/substance group *Solutio Cordes*[®].

Supplier	Substance	Batch	Spectra
Ichthyol/Phönix	Solutio Cordes [®]	12B0005	1
Ichthyol/Phönix	Solutio Cordes [®]	12B005	15
Ichthyol	Solutio Cordes [®]	12B006	2
Ichthyol	Solutio Cordes [®]	12B006	1
Ichthyol	Solutio Cordes [®]	12B005	1

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Supplier	Substance	Batch	Spectra
Ichthyol	Solutio Cordes [®]	13B001	1
Ichthyol- Gesellschaft ...	Solutio Cordes [®]	13B001	1
Ichthyol/Phönix	Solutio Cordes [®]	13B002	3
Ichthyol /Noweda	Solutio Cordes [®]	12B005	1
Ichtyol	Solutio Cordes [®]	13B002	1
ICHTYOL-GESELLSCHAFT	Solutio Cordes [®]	13B001	1
Ichthyol / Gehe	Solutio Cordes [®]	14B006	1
Gehe/Ichthyol	Solutio Cordes [®]	14b006	1
Ichthyol /Noweda	Solutio Cordes [®]	13B002	1
Ichthyol/Phönix	Solutio Cordes [®]	14B011	1
Phönix	Solutio Cordes [®]	13B002	1
Ichthyol Gesellschaft	Solutio Cordes [®]	14B006	1
Fiebig	Solutio Cordes [®]	22314	1
Ichthyol Gesellschaft	Solutio Cordes [®]	14B012	1
Ichthyol/Phönix	Solutio Cordes [®]	15B001	1
Ichthyol / G	Solutio Cordes [®]	14B012	1
Ichthyol / E	Solutio Cordes [®]	15B005	3
Ichthyol / G	Solutio Cordes [®]	16B005	2
Ichthyol-Gesellschaft	Solutio Cordes [®]	15B005	1

- 4168 spectra from 396 *Apo-Ident* customers from a total of 2097 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Solutio Cordes*[®] can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Solutio Cordes*[®] and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 598
Type B	0	140	0	23 208
Type C	0	42	2	4168

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9558 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9508 %)	100.0000 % (> 95.7143 %)
Type C	100.0000 % (> 98.5361 %)	95.4545 % (> 88.6364 %)

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

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

exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

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

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
30996	30996	0.00	77.06
31076	31076	0.00	80.85

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Spearmint oil**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 30453-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Spearmint oil; Oleum mentha spicata

Special notes

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

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Spearmint oil*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Taoasis	Spearmint oil	33894-111575BAG90451	31135	30	not required
Taoasis	Spearmint oil	946-120296	31685	40	not required
Taoasis	Spearmint oil	421012-129111	33481	40	not required

Validation samples

A total of 48 238 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 *Spearmint oil*. These samples are listed above in the [calibration samples](#) section.
- 20 568 spectra from a total of 483 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 100 spectra of 3 reference samples from the substance/substance group *Spearmint oil*.

Supplier	Substance	Batch	Sample ID	Spectra
Taoasis	Spearmint oil	946-120296	31685 [†]	20
Taoasis	Spearmint oil	421012-126408	33200	40
Taoasis	Spearmint oil	421012-126408	33201	40

- 23 248 spectra from a total of 576 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 3 spectra from 2 *Apo-Ident* customers from 3 batches from the substance/substance group *Spearmint oil*.

Supplier	Substance	Batch	Spectra
Taoasis	Spearmint oil	27537-96244	1
Taoasis	Spearmint oil	421012-123260	1
Taoasis	Spearmint oil	421012-125373	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*.

- 4209 spectra from 396 *Apo-Ident* customers from a total of 2108 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Spearmint oil* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Spearmint oil* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 568
Type B	0	100	0	23 248
Type C	0	3	0	4209

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9556 %)	100.0000 % (> 94.5455 %)
Type B	100.0000 % (> 99.9509 %)	100.0000 % (> 94.0000 %)
Type C	100.0000 % (> 98.5583 %)	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
31135	31135	0.00	68.98
31685	31685	0.00	65.10
33481	33481	0.00	52.96

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Spruce needle oil / Pine silvestris oil / Franki...**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 31032-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Spruce needle oil / Pine silvestris oil / Frankincense oil / Silver fir oil; Frankincense oil; Oleum abies alba; Oleum boswellia serrata; Oleum pini sibiricum; Oleum pini silvestris; Pine silvestris oil; Silver fir oil; Spruce needle oil

Special notes

When selecting the *Spruce needle oil / Pine silvestris oil / Frankincense oil / Silver fir oil* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Spruce needle oil / Pine silvestris oil / Frankincense oil / Silver fir oil*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Taoasis	Silver fir oil	120830-111781	31032	40	not required
Taoasis	Silver fir oil	211-114751	31255	40	not required
Taoasis	Frankincense oil	15181-119714	31633	40	not required

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Taoasis	Silver fir oil	01A0B15-121623	31754	40	not required
Taoasis	Spruce needle oil	1507-122520	31819	40	not required
Taoasis	Spruce needle oil	1719-124011	32066	40	not required
Taoasis	Frankincense oil	1509-125625	33052	40	not required
Taoasis	Frankincense oil	4314-129238	33646	40	not required
Taoasis	Frankincense oil	1500910-128786	33650	40	not required
Taoasis	Frankincense oil	1500910-128786	33652	40	not required
Taoasis	Spruce needle oil	10213-149	33726	40	not required
Taoasis	Pine silvestris ...	1790-129074	33815	30	not required
Primavera	Pine silvestris ...	00664E26	34177	40	not required
Primavera	Silver fir oil	00287M26	34391	40	not required

Validation samples

A total of 48 238 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 550 spectra of 14 reference samples from the substance/substance group *Spruce needle oil* / *Pine silvestris oil* / *Frankincense oil* / *Silver fir oil*. These samples are listed above in the [calibration samples](#) section.
- 20 128 spectra from a total of 473 batches from further 155 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 630 spectra of 18 reference samples from the substance/substance group *Spruce needle oil* / *Pine silvestris oil* / *Frankincense oil* / *Silver fir oil*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Spruce needle oil	11220801	30613	40
Taoasis	Spruce needle oil	29828-103169BAG90451	30672	40
Taoasis	Frankincense oil	3.26550	30843	40
Taoasis	Frankincense oil	15181-119714	31633 [†]	20
Taoasis	Silver fir oil	01A0B15-121623	31754 [†]	20
Taoasis	Spruce needle oil	1507-122520	31819 [†]	20
Taoasis	Frankincense oil	1509-122197	31820	60
Taoasis	Spruce needle oil	1719-124011	32066 [†]	20
Taoasis	Spruce needle oil	1769-124969	32479	40
Taoasis	Silver fir oil	01A0B16-125623	33026	40
Taoasis	Silver fir oil	01A0B16-125623	33027	40

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Supplier	Substance	Batch	Sample ID	Spectra
Taoasis	Pine silvestris oil	1790-129074	33815 [†]	10
Taoasis	Pine silvestris oil	1790-125357BAG90451	33829	40
Taoasis	Spruce needle oil	11647-2942	34112	40
Taoasis	Frankincense oil	2124-2905	34277	40
Primavera	Pine silvestris oil	00398J26	34292	40
Primavera	Pine silvestris oil	00028A27	34378	40
Primavera	Frankincense oil	00446M26	34400	40

- 22718 spectra from a total of 561 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 23 spectra from 13 *Apo-Ident* customers from 18 batches from the substance/substance group *Spruce needle oil* / *Pine silvestris oil* / *Frankincense oil* / *Silver fir oil*.

Supplier	Substance	Batch	Spectra
Caelo	Spruce needle oil	10185604	1
Taoasis	Spruce needle oil	29828-107964	1
Caelo	Spruce needle oil	11324401	4
Taoasis	Spruce needle oil	534474-111585	1
Taoasis	Spruce needle oil	531766-109893	1
Primavera	Spruce needle oil	1670814	1
Caelo	Spruce needle oil	13152001	2
Taoasis	Spruce needle oil	534374-22869	1
Taoasis/Sanacorp	Spruce needle oil	534474-113171	1
Taoasis	Spruce needle oil	442-113922	1
Taoasis	Spruce needle oil	1769-124949	1
Taoasis	Spruce needle oil	1769-124969	2
Taoasis/Sanacorp	Spruce needle oil	534474-111869	1
Taoasis/Sanacorp	Spruce needle oil	11647-2942	1
Taoasis	Frankincense oil	549702-112299	1
Apoth.Bauer&Co/Noweda	Frankincense oil	3175391505	1
Apoth.Bauer&Co/Noweda	Frankincense oil		1
Taoasis	Silver fir oil	212-120342	1

- 4189 spectra from 396 *Apo-Ident* customers from a total of 2093 batches from a further 132 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 *Spruce needle oil* / *Pine silvestris oil* / *Frankincense oil* / *Silver fir oil* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Spruce needle oil* / *Pine silvestris oil* / *Frankincense oil* / *Silver fir oil* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	550	0	20 128
Type B	0	477	153	22 718
Type C	0	8	15	4189

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9552 %)	100.0000 % (> 98.9091 %)
Type B	100.0000 % (> 99.9507 %)	75.7143 % (> 75.2381 %)
Type C	100.0000 % (> 98.5376 %)	34.7826 % (> 21.7391 %)

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

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

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

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
32066	32066	0.00	20.48
34391	34391	0.00	48.20
33052	33052	0.00	36.18
31633	31633	0.00	72.36
33650	33650	0.00	84.36
33652	33652	0.00	82.39
31754	31754	0.00	19.98
33815	33815	0.00	15.73
33646	33646	0.00	18.07
33726	33726	0.00	14.19
31819	31819	0.00	16.32
31032	31032	0.00	31.69
31255	31255	0.00	36.76
34177	34177	0.00	21.90

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Star anise oil, organic**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 30670-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Star anise oil, organic; Oleum Anisi stellati

Special notes

When selecting the *Star anise oil, organic* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Star anise oil, organic*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Taoasis	Star anise oil, ...	2241027-120475	31681	40	not required
Taoasis	Star anise oil, ...	1492-125379	32794	40	not required
Taoasis	Star anise oil, ...	1492-125379	32935	40	not required

Validation samples

A total of 48 238 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 *Star anise oil, organic*. These samples are listed above in the [calibration samples](#) section.
- 20 558 spectra from a total of 484 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 180 spectra of 5 reference samples from the substance/substance group *Star anise oil, organic*.

Supplier	Substance	Batch	Sample ID	Spectra
Taoasis	Star anise oil, organic	B080009-99431BAG90451	30670	40
Taoasis	Star anise oil, organic	2241027-120475	31681 [†]	20
Taoasis	Star anise oil, organic	42803-290	33622	40
Taoasis	Star anise oil, organic	42803-290	33875	40
Taoasis	Star anise oil, organic	42803-3438	34288	40

- 23 168 spectra from a total of 574 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 24 spectra from 13 *Apo-Ident* customers from 19 batches from the substance/substance group *Star anise oil, organic*.

[†]These spectra were recorded from 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
Taoasis	Star anise oil, organic	26735-110455	1
Taoasis	Star anise oil, organic	26735-108555	1
Caelo	Star anise oil, organic	12322503	1
Taoasis	Star anise oil, organic	26735-111137	2
Apotheker S Bauer&Comp	Star anise oil, organic		1
Taoasis	Star anise oil, organic	26735-113054	1
Taoasis/Sanacorp	Star anise oil, organic	26735-111137	2
Taoasis/Sanacorp	Star anise oil, organic	26735-112250	1
Caelo	Star anise oil, organic	12322507	1
Caelo	Star anise oil, organic	13056105	1
Taoasis	Star anise oil, organic	130910-113040	1
Schubert	Star anise oil, organic	1236E0-1518	1
Taoasis	Star anise oil, organic	2241027-120196	1
Taoasis	Star anise oil, organic	26569-115911	2
Caelo	Star anise oil, organic	15148901	1
Taoasis/Noweda	Star anise oil, organic	1465-121083h08	1
Taoasis	Star anise oil, organic	1492-121627	1
Taoasis	Star anise oil, organic	1492-125379	2
Taoasis	Star anise oil, organic	1492-123225	1
Taoasis	Star anise oil, organic	1492-125315	1

- 4188 spectra from 394 *Apo-Ident* customers from a total of 2092 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Star anise oil, organic* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Star anise oil, organic* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 558
Type B	0	170	10	23 128
Type C	0	21	3	4188

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9556 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9515 %)	94.4444 % (> 92.7778 %)
Type C	100.0000 % (> 98.5374 %)	87.5000 % (> 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
31681	31681	0.00	44.59
32794	32794	0.00	46.60
32935	32935	0.00	49.72

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Stomahesive[®] adhesive paste**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 30974-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Stomahesive[®] adhesive paste

Special notes

When selecting the *Stomahesive[®] adhesive paste* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Stomahesive[®] adhesive paste*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
ConvaTec Inc.	Stomahesive [®] adh...	2D117	30974	70	not required
ConvaTec Inc.	Stomahesive [®] adh...	2M084	31087	40	not required
ConvaTec Inc.	Stomahesive [®] adh...	6L039	33474	40	not required

Validation samples

A total of 48 238 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 150 spectra of 3 reference samples from the substance/substance group *Stomahesive® adhesive paste*. These samples are listed above in the [calibration samples](#) section.
- 20 528 spectra from a total of 483 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 90 spectra of 3 reference samples from the substance/substance group *Stomahesive® adhesive paste*.

Supplier	Substance	Batch	Sample ID	Spectra
ConvaTec Inc.	Stomahesive® adhesive paste	2D117	30974 [†]	10
ConvaTec Inc.	Stomahesive® adhesive paste	6D079	32761	40
ConvaTec Inc.	Stomahesive® adhesive paste	5G062	32954	40

- 23 258 spectra from a total of 575 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 24 spectra from 4 *Apo-Ident* customers from 1 batches from the substance/substance group *Stomahesive® adhesive paste*.

Supplier	Substance	Batch	Spectra
Convatec	Stomahesive® adhesive paste	5G062	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*.

- 4188 spectra from 396 *Apo-Ident* customers from a total of 2110 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Stomahesive*[®] *adhesive paste* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Stomahesive*[®] *adhesive paste* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 528
Type B	0	90	0	23 258
Type C	0	24	0	4188

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9555 %)	100.0000 % (> 96.0000 %)
Type B	100.0000 % (> 99.9509 %)	100.0000 % (> 93.3333 %)
Type C	100.0000 % (> 98.5374 %)	100.0000 % (> 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
30974	30974	0.00	53.27
31087	31087	0.00	58.31
33474	33474	0.00	57.89

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Strawberry aroma**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 30643-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Strawberry aroma; Strawberry flavour

Special notes

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

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Strawberry aroma*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Strawberry aroma	11178804	30643	40	1402439
Caelo	Strawberry aroma	13252407	31395	40	not required
Caelo	Strawberry aroma	15411807	32814	40	not required
Caelo	Strawberry aroma	15411807	32838	40	1704074

Validation samples

A total of 48 238 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 *Strawberry aroma*. These samples are listed above in the [calibration samples](#) section.
- 20 518 spectra from a total of 483 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 160 spectra of 4 reference samples from the substance/substance group *Strawberry aroma*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Strawberry aroma	14311215	32567	40
Caelo	Strawberry aroma	14311215	32837	40
Caelo	Strawberry aroma	170246	33056	40
Caelo	Strawberry aroma	180832	34077	40

- 23 188 spectra from a total of 575 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 36 spectra from 24 *Apo-Ident* customers from 19 batches from the substance/substance group *Strawberry aroma*.

Supplier	Substance	Batch	Spectra
Caelo	Strawberry aroma	12183504	2

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Strawberry aroma	10184917	1
Caelo	Strawberry aroma	12183511	1
Caelo	Strawberry aroma	11178813	1
Caelo	Strawberry aroma	12183513	4
Caelo	Strawberry aroma	13252405	1
Caelo	Strawberry aroma	13252407	2
Caelo	Strawberry aroma	9101405	1
Caelo	Strawberry aroma	13252417	1
Caelo	Strawberry aroma	13252409	1
Caelo	Strawberry aroma	14311204	1
Caelo	Strawberry aroma	14311209	4
Caelo	Strawberry aroma	14311215	2
Hedinger	Strawberry aroma	14311215	1
Caelo	Strawberry aroma	15411805	5
Caelo	Strawberry aroma	15411807	2
Caelo	Strawberry aroma	15411813	1
Caelo	Strawberry aroma	17024606	3
Caelo	Strawberry aroma	17024604	1
Caelo	Strawberry aroma	17024608	1

- 4176 spectra from 394 *Apo-Ident* customers from a total of 2092 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Strawberry aroma* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Strawberry aroma* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 518
Type B	0	160	0	23 188
Type C	0	36	0	4176

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9555 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9508 %)	100.0000 % (> 96.2500 %)
Type C	100.0000 % (> 98.5364 %)	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
30643	30643	0.00	99.32
32814	32814	0.00	92.56
31395	31395	0.00	80.31
32838	32838	0.00	65.97

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Swiss pine oil**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 31553-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Swiss pine oil; Oleum pinus cembra

Special notes

When selecting the *Swiss pine oil* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Swiss pine oil*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Taoasis	Swiss pine oil	4892-117271	31553	40	not required
Taoasis	Swiss pine oil	3023-120087	31680	40	not required
Taoasis	Swiss pine oil	12069-127103	32934	40	not required
Taoasis	Swiss pine oil	10304-128929	33645	40	not required

Validation samples

A total of 48 238 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 *Swiss pine oil*. These samples are listed above in the [calibration samples](#) section.
- 20 518 spectra from a total of 482 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 120 spectra of 4 reference samples from the substance/substance group *Swiss pine oil*.

Supplier	Substance	Batch	Sample ID	Spectra
Taoasis	Swiss pine oil	4892-117271	31553 [†]	20
Taoasis	Swiss pine oil	3023-120087	31680 [†]	20
Taoasis	Swiss pine oil	201610159-126370	32793	40
Primavera	Swiss pine oil	00661A27	34386	40

- 23 228 spectra from a total of 574 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 2 spectra from 2 *Apo-Ident* customers from 2 batches from the substance/substance group *Swiss pine oil*.

[†]These spectra were recorded from 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
Oswald	Swiss pine oil	9971217	1
Caelo	Swiss pine oil	6158653	1

- 4210 spectra from 396 *Apo-Ident* customers from a total of 2109 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Swiss pine oil* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Swiss pine oil* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 518
Type B	0	80	40	23 228
Type C	0	2	0	4210

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9555 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9508 %)	66.6667 % (> 64.1667 %)
Type C	100.0000 % (> 98.5703 %)	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
31553	31553	0.00	20.70
33645	33645	0.00	17.54
32934	32934	0.00	28.37
31680	31680	0.00	14.78

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Tea tree oil**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 30959-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Tea tree oil; Oleum melaleuca alternifolia

Special notes

When selecting the *Tea tree oil* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Tea tree oil*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Taoasis	Tea tree oil	533902-109942BAG91303	30959	40	not required
Taoasis	Tea tree oil	34828-113642BAG91303	31134	40	not required
Taoasis	Tea tree oil	44737-121997	31762	40	not required

Validation samples

A total of 48 238 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 *Tea tree oil*. These samples are listed above in the [calibration samples](#) section.
- 20 558 spectra from a total of 483 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 140 spectra of 4 reference samples from the substance/substance group *Tea tree oil*.

Supplier	Substance	Batch	Sample ID	Spectra
Taoasis	Tea tree oil	44737-121997	31762 [†]	20
Taoasis	Tea tree oil	52642-125539	33017	40
Taoasis	Tea tree oil	52642-124527	33018	40
Primavera	Tea tree oil	00667A27	34396	40

- 23 208 spectra from a total of 574 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 28 spectra from 9 *Apo-Ident* customers from 13 batches from the substance/substance group *Tea tree oil*.

Supplier	Substance	Batch	Spectra
Taoasis	Tea tree oil	20269-116833	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
Taoasis	Tea tree oil	1469-117418	2
Taoasis	Tea tree oil	28348-119841	1
Taoasis	Tea tree oil	28348-121515	1
Taoasis	Tea tree oil	28348-121597	2
Caelo	Tea tree oil	15051806	2
Caelo	Tea tree oil	15051807	1
Caelo	Tea tree oil	15337105	1
Caelo	Tea tree oil	15337106	1
Taoasis	Tea tree oil	52642-124559	1
Taoasis	Tea tree oil	52642-124919	1
Taoasis	Tea tree oil	52642-12078	1
Taoasis	Tea tree oil	52642-125539BAG91303	12

- 4184 spectra from 395 *Apo-Ident* customers from a total of 2098 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Tea tree oil* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Tea tree oil* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 558
Type B	0	140	0	23 208
Type C	0	28	0	4184

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9556 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9508 %)	100.0000 % (> 95.7143 %)
Type C	100.0000 % (> 98.5370 %)	100.0000 % (> 78.5714 %)

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
30959	30959	0.00	51.36
31134	31134	0.00	53.94
31762	31762	0.00	59.18

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Thuja (essential oil)**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 33828-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Thuja (essential oil)

Special notes

When selecting the *Thuja (essential oil)* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Thuja (essential oil)*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Taoasis	Thuja (essential...	66255-969	33828	40	not required
Taoasis	Thuja (essential...	66255-2932	34287	40	not required

Validation samples

A total of 48 238 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 *Thuja (essential oil)*. These samples are listed above in the [calibration samples](#) section.
- 20 598 spectra from a total of 484 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 40 spectra of 1 reference samples from the substance/substance group *Thuja (essential oil)*.

Supplier	Substance	Batch	Sample ID	Spectra
Taoasis	Thuja (essential oil)	28508-121881	34038	40

- 23 308 spectra from a total of 577 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 0 spectra from 0 *Apo-Ident* customers from 0 batches from the substance/substance group *Thuja (essential oil)*.
- 4212 spectra from 396 *Apo-Ident* customers from a total of 2111 batches from a further 135 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Thuja (essential oil)* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Thuja (essential oil)* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 598
Type B	0	40	0	23 308
Type C	0	0	0	4212

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9558 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9513 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 98.5344 %)	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
33828	33828	0.00	42.79
34287	34287	0.00	45.86

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Thyme oil, red**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 30929-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Thyme oil, red; Oleum thymus vulgaris

Special notes

When selecting the *Thyme oil, red* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Thyme oil, red*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Taoasis	Thyme oil, red	31911-109378	30929	40	not required
Taoasis	Thyme oil, red	9434-115427	31259	40	not required
Taoasis	Thyme oil, red	56081-124964	32482	40	not required
Taoasis	Thyme oil, red	1829-125364	32981	40	not required
Taoasis	Thyme oil, red	1976-2943	34103	40	not required

Validation samples

A total of 48 238 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 *Thyme oil, red*. These samples are listed above in the [calibration samples](#) section.
- 20 478 spectra from a total of 481 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 40 spectra of 1 reference samples from the substance/substance group *Thyme oil, red*.

Supplier	Substance	Batch	Sample ID	Spectra
Taoasis	Thyme oil, red	40517-121881	32472	40

- 23 308 spectra from a total of 577 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 16 spectra from 3 *Apo-Ident* customers from 12 batches from the substance/substance group *Thyme oil, red*.

Supplier	Substance	Batch	Spectra
Taoasis	Thyme oil, red	33092-111620	1
Taoasis	Thyme oil, red	14381-117385	1
Taoasis	Thyme oil, red	9434-115525	1
Taoasis	Thyme oil, red	25394-118296	1

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Supplier	Substance	Batch	Spectra
Taoasis	Thyme oil, red	32444-118785	4
Taoasis	Thyme oil, red	40517-121881	2
Taoasis	Thyme oil, red	33635-120088	1
Taoasis	Thyme oil, red	43637-122713	1
Taoasis	Thyme oil, red	43637-123574	1
Taoasis	Thyme oil, red	43637-122852	1
Taoasis	Thyme oil, red	43637-124964	1
Taoasis/Sanacorp	Thyme oil, red	1976-3455	1

- 4196 spectra from 396 *Apo-Ident* customers from a total of 2099 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Thyme oil, red* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Thyme oil, red* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 478
Type B	0	40	0	23 308
Type C	0	14	2	4196

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9554 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9513 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 98.5389 %)	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
32981	32981	0.00	24.56
32482	32482	0.00	34.31
30929	30929	0.00	26.56
31259	31259	0.00	21.57
34103	34103	0.00	28.14

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Thyme oil, white / Coriander oil**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 31552-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Thyme oil, white / Coriander oil; Coriander oil; Oleum coriandri; Thyme oil, white

Special notes

When selecting the *Thyme oil, white / Coriander oil* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Thyme oil, white / Coriander oil*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Taoasis	Coriander oil	9324-114961	31552	40	not required
Taoasis	Coriander oil	25134-117444	31690	40	not required
Taoasis	Coriander oil	104709-126301	32792	40	not required
Primavera	Thyme oil, white	01067J25	33796	40	not required
Taoasis	Thyme oil, white	111400-970	33818	40	not required
Primavera	Thyme oil, white	00593E26	34176	40	not required
Taoasis	Coriander oil	109291-2941	34286	40	not required

Validation samples

A total of 48 238 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 *Thyme oil, white / Coriander oil*. These samples are listed above in the [calibration samples](#) section.
- 20 398 spectra from a total of 479 batches from further 157 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 240 spectra of 7 reference samples from the substance/substance group *Thyme oil, white / Coriander oil*.

Supplier	Substance	Batch	Sample ID	Spectra
Taoasis	Coriander oil	9324-114961	31552 [†]	20
Taoasis	Coriander oil	25134-117444	31690 [†]	20
Taoasis	Coriander oil	104709-127188	33053	40
Taoasis	Thyme oil, white	925	33819	40
Taoasis	Coriander oil	9291-1307	33990	40
Primavera	Thyme oil, white	00146J26	34293	40
Primavera	Thyme oil, white	00535M26	34369	40

- 23 108 spectra from a total of 571 batches from further 202 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

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

- 5 spectra from 5 *Apo-Ident* customers from 5 batches from the substance/substance group *Thyme oil, white / Coriander oil*.

Supplier	Substance	Batch	Spectra
taoasis	Coriander oil	104709127	1
Caelo	Coriander oil	15229607	1
Caelo	Coriander oil	16140401	1
GEHE	Coriander oil	17050403	1
Sanacorp	Coriander oil	18125703	1

- 4207 spectra from 395 *Apo-Ident* customers from a total of 2106 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Thyme oil, white / Coriander oil* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Thyme oil, white / Coriander oil* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 398
Type B	0	240	0	23 108
Type C	0	5	0	4207

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9553 %)	100.0000 % (> 97.8571 %)
Type B	100.0000 % (> 99.9507 %)	100.0000 % (> 97.5000 %)
Type C	100.0000 % (> 98.5488 %)	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
33818	33818	0.00	66.99
31552	31552	0.00	66.21
32792	32792	0.00	69.75
31690	31690	0.00	68.89
34286	34286	0.00	65.76
33796	33796	0.00	40.59
34176	34176	0.00	42.37

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Vetiver bourbon oil**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 31546-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Vetiver bourbon oil; Oleum vetiveria zizanoides

Special notes

When selecting the *Vetiver bourbon oil* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Vetiver bourbon oil*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Taoasis	Vetiver bourbon ...	7141-116418	31546	40	not required
Taoasis	Vetiver bourbon ...	7141-119962	31684	40	not required
Taoasis	Vetiver bourbon ...	7141-128198	33647	40	not required

Validation samples

A total of 48 238 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 *Vetiver bourbon oil*. These samples are listed above in the [calibration samples](#) section.
- 20 558 spectra from a total of 483 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 120 spectra of 4 reference samples from the substance/substance group *Vetiver bourbon oil*.

Supplier	Substance	Batch	Sample ID	Spectra
Taoasis	Vetiver bourbon oil	7141-116418	31546 [†]	20
Taoasis	Vetiver bourbon oil	7141-119962	31684 [†]	20
Taoasis	Vetiver bourbon oil	7141-124922	32810	40
Taoasis	Vetiver bourbon oil	7141-124922	33046	40

- 23 228 spectra from a total of 575 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 5 spectra from 1 *Apo-Ident* customers from 3 batches from the substance/substance group *Vetiver bourbon oil*.

Supplier	Substance	Batch	Spectra
Taoasis	Vetiver bourbon oil	7141-122195	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
Taoasis	Vetiver bourbon oil	7141-119174	1
Taoasis	Vetiver bourbon oil	7141-124600	2

- 4207 spectra from 396 *Apo-Ident* customers from a total of 2108 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Vetiver bourbon oil* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Vetiver bourbon oil* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 558
Type B	0	120	0	23 228
Type C	0	5	0	4207

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9556 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9508 %)	100.0000 % (> 95.0000 %)
Type C	100.0000 % (> 98.5488 %)	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
31546	31546	0.00	31.89
31684	31684	0.00	31.57
33647	33647	0.00	31.22

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group	Wart ointment InfectoPharm [®] (NRF 11.31)
Substance class	APIs & excipients, liquid/semi-solid (other)
Report date	24/05/2019
Report number	30730-2019-05-24
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Wart ointment InfectoPharm[®] (NRF 11.31)

Special notes

When selecting the *Wart ointment InfectoPharm[®] (NRF 11.31)* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-6679-5	<i>European Pharmacopoeia 9th Edition, Basic Version 2017</i> [3]
Komm2.2.40	<i>Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident</i> [4]
AA004	<i>Erstellung und Validierung eines IdentModul-Updates</i>
Appendix F	Addition to the second-stage models

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Wart ointment InfectoPharm[®] (NRF 11.31)*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Infectopharm	Wart ointment In...	S031201.1	30730	40	not required
Infectopharm	Wart ointment In...	S031201.1	30905	40	not required
Infectopharm	Wart ointment In...	S121103.1	30906	40	not required

Validation samples

A total of 48 238 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 *Wart ointment InfectoPharm®* (NRF 11.31). These samples are listed above in the [calibration samples](#) section.
- 20 558 spectra from a total of 484 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 120 spectra of 3 reference samples from the substance/substance group *Wart ointment InfectoPharm®* (NRF 11.31).

Supplier	Substance	Batch	Sample ID	Spectra
Infectopharm	Wart ointment InfectoPharm® ...	S021601.1	32593	40
Infectopharm	Wart ointment InfectoPharm® ...	S071602.1	32953	40
Infectopharm	Wart ointment InfectoPharm® ...	S071602.1	33515	40

- 23 228 spectra from a total of 576 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 95 spectra from 51 *Apo-Ident* customers from 29 batches from the substance/substance group *Wart ointment InfectoPharm®* (NRF 11.31).

Supplier	Substance	Batch	Spectra
Löwen City-Apotheke Bar...	Wart ointment InfectoPharm® ...	8032013	1
Infectopharm (Phoenix)	Wart ointment InfectoPharm® ...		1
Gehe	Wart ointment InfectoPharm® ...		1

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Supplier	Substance	Batch	Spectra
InfectoPharm/Anzag	Wart ointment InfectoPharm [®] ...	3013I-07003	2
Infectopharm	Wart ointment InfectoPharm [®] ...		1
nfectoPharm	Wart ointment InfectoPharm [®] ...		1
Infectopharm	Wart ointment InfectoPharm [®] ...		32
Sanacorp	Wart ointment InfectoPharm [®] ...		2
InfectoPharm/ E	Wart ointment InfectoPharm [®] ...	S111202	1
infectopharm	Wart ointment InfectoPharm [®] ...		2
InfectoPharm	Wart ointment InfectoPharm [®] ...		2
infectipharm/Phönix	Wart ointment InfectoPharm [®] ...		1
Caelo	Wart ointment InfectoPharm [®] ...		2
Infectopharm	Wart ointment InfectoPharm [®] ...		1
Euro OTC	Wart ointment InfectoPharm [®] ...		1
gehe/infecto	Wart ointment InfectoPharm [®] ...		1
Infectopharm / Gehe	Wart ointment InfectoPharm [®] ...		1
InfectopharmNoweda	Wart ointment InfectoPharm [®] ...		1
InfectoPharm/Noweda	Wart ointment InfectoPharm [®] ...		2
Infectopharm/Phoenix Le...	Wart ointment InfectoPharm [®] ...		1
Eigenherstellung	Wart ointment InfectoPharm [®] ...		1
Infectopharm / Alliance...	Wart ointment InfectoPharm [®] ...		1
Infectopharm/Noweda	Wart ointment InfectoPharm [®] ...		5
Infecto/Spangro	Wart ointment InfectoPharm [®] ...	S0215011	1
Infecto/Gehe	Wart ointment InfectoPharm [®] ...		1
Phönix Gotha	Wart ointment InfectoPharm [®] ...		1
Infect/PX	Wart ointment InfectoPharm [®] ...		2
Infectopharm/Gehe	Wart ointment InfectoPharm [®] ...		1
InfectoPharm	Wart ointment InfectoPharm [®] ...		1
PX/Infectop	Wart ointment InfectoPharm [®] ...		3
Infectopharm Arzneimittel	Wart ointment InfectoPharm [®] ...		1
Infectopharm/K	Wart ointment InfectoPharm [®] ...		1
Infectopharm/Kehr	Wart ointment InfectoPharm [®] ...		1
Infectopharm/Phönix	Wart ointment InfectoPharm [®] ...		3
Fagron	Wart ointment InfectoPharm [®] ...		1
Ichthyol-Gesellschaft C...	Wart ointment InfectoPharm [®] ...		1
InfectoPharm/AHD	Wart ointment InfectoPharm [®] ...		1
InfectoPharm/Anzag	Wart ointment InfectoPharm [®] ...	716A-03898	1
Infec/ Phönix	Wart ointment InfectoPharm [®] ...		1
Infectopharm/Alliance H...	Wart ointment InfectoPharm [®] ...		1
InfectoPharm/Gehe	Wart ointment InfectoPharm [®] ...		1
Infectopharm/G	Wart ointment InfectoPharm [®] ...		1
Noweda/Infectopharm	Wart ointment InfectoPharm [®] ...		1
Infectopharm/Anzag	Wart ointment InfectoPharm [®] ...		1
InfectoPharm/GEHE	Wart ointment InfectoPharm [®] ...		1
Infectopharm/Phoenix	Wart ointment InfectoPharm [®] ...		2
InfectoPharm / Gehe	Wart ointment InfectoPharm [®] ...		1
Infectopharm/ Noweda	Wart ointment InfectoPharm [®] ...		1

- 4117 spectra from 388 *Apo-Ident* customers from a total of 2083 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Wart ointment InfectoPharm[®]* (*NRF 11.31*) can clearly be distinguished from all other substances using NIR spectroscopy with

Apo-Ident. For this purpose, all relevant spectra of the various substances were compared with *Wart ointment InfectoPharm® (NRF 11.31)* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 558
Type B	0	120	0	23 228
Type C	0	93	2	4117

The substance/substance group *Wart ointment InfectoPharm® (NRF 11.31)* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9556 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9508 %)	100.0000 % (> 95.0000 %)
Type C	100.0000 % (> 98.5352 %)	97.8947 % (> 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 new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

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

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
30730	30730	0.00	239.75
30905	30905	0.00	233.57
30906	30906	0.00	229.47

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group	Water and aqueous solutions
Substance class	APIs & excipients, liquid/semi-solid (other)
Report date	24/05/2019
Report number	31047-2019-05-24
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Water and aqueous solutions; Aloe Vera gel, 1:1; Aloe vera gel, 10x concentrated; Aqua; Bepanthen® solution; Retterspitz external; SyrSpend® SF pH4 cherry aroma; SyrSpend® SF pH4 aroma free; Water

Special notes

When selecting the *Water and aqueous solutions* substance/substance group, the following information is displayed to the user:

- Advice for the identification of water: Preserved, purified and distilled water can not be conclusively distinguished by spectral analysis. An additional analysis of identity may be required.

Applicable documents

978-3-7692-6679-5	<i>European Pharmacopoeia 9th Edition, Basic Version 2017</i> [3]
Komm2.2.40	<i>Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident</i> [4]
AA004	<i>Erstellung und Validierung eines IdentModul-Updates</i>
Appendix F	Addition to the second-stage models

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Water and aqueous solutions*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Bayer	Bepanthen® solut. ...	KP08DR1	31047	40	not required
Caelo	Aloe Vera gel, 1:1	13025802	31145	40	not required

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Aloe vera gel, 1...	13045901	31146	40	not required
Hedinger	Water	219066	31623	40	not required
Fagron	SyrSpend [®] SF pH4...	1503D009	31670	40	not required
Fagron	SyrSpend [®] SF pH4...	1503D017	31671	40	not required
Caelo	Water	15068701	31675	30	not required
Fagron	SyrSpend [®] SF pH4...	1412D002	31722	40	not required
Fagron	SyrSpend [®] SF pH4...	1503D017	31723	40	not required
Bayer	Bepanthen [®] solut...	KP0ASHC	31857	40	not required
Caelo	Aloe vera gel, 1...	15185503	31862	40	not required
Caelo	Aloe Vera gel, 1:1	15329203	31866	40	not required
Caelo	Aloe Vera gel, 1:1	153292	31880	40	20151111*
Caelo	Aloe Vera gel, 1:1	153292	31881	40	20151111*
Caelo	Water	153943	32079	40	20151215*
Caelo	Aloe vera gel, 1...	161922	32313	40	20160707*
Retterspitz G...	Retterspitz exte...	016100	32785	40	not required
Retterspitz G...	Retterspitz exte...	017058	33430	40	not required
Retterspitz G...	Retterspitz exte...	016240	33431	40	not required
Bayer	Bepanthen [®] solut...	KP0C3FU	33612	40	not required
Fagron	SyrSpend [®] SF pH4...	1704492/1	33787	40	not required

Validation samples

A total of 48 238 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 830 spectra of 21 reference samples from the substance/substance group *Water and aqueous solutions*. These samples are listed above in the [calibration samples](#) section.
- 19 848 spectra from a total of 467 batches from further 152 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 1780 spectra of 50 reference samples from the substance/substance group *Water and aqueous solutions*.

*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.

Supplier	Substance	Batch	Sample ID	Spectra
Hedinger	Water	219066	31623 [†]	20
Fagron	SyrSpend [®] SF pH4 aroma free	1503D009	31670 [†]	20
Fagron	SyrSpend [®] SF pH4 cherry aroma	1503D017	31671 [†]	20
Caelo	Water	15068701	31675 [†]	30
Fagron	SyrSpend [®] SF pH4 aroma free	1412D002	31722 [†]	20
Fagron	SyrSpend [®] SF pH4 cherry aroma	1503D017	31723 [†]	20
Bayer	Bepanthen [®] solution	KP0ASHC	31857 [†]	20
Caelo	Aloe vera gel, 10x concentra...	15185503	31862 [†]	20
Caelo	Aloe Vera gel, 1:1	15329203	31866 [†]	20
Caelo	Aloe Vera gel, 1:1	153292	31880 [†]	20
Caelo	Aloe Vera gel, 1:1	153292	31881 [†]	20
Caelo	Water	153944	32081	40
Caelo	Water	153712	32083	40
Caelo	Aloe Vera gel, 1:1	162489	32580	40
Bayer	Bepanthen [®] solution	KP0B60L	32719	40
Fagron	SyrSpend [®] SF pH4 aroma free	1507402	32737	40
Fagron	SyrSpend [®] SF pH4 cherry aroma	1503255	32738	40
Retterspitz GmbH	Retterspitz external	016179	32784	30
Fagron	SyrSpend [®] SF pH4 cherry aroma	1603252/2	32842	40
Fagron	SyrSpend [®] SF pH4 aroma free	1507402	32843	40
Caelo	Water	162553	32895	40
Caelo	Water	162867	32896	40
Caelo	Aloe Vera gel, 1:1	162912	32899	40
Bayer	Bepanthen [®] solution	KP0BJ61	32949	40
Caelo	Water	163533	33176	40
Caelo	Water	170018	33177	40
Caelo	Aloe Vera gel, 1:1	171341	33411	40
Fagron	SyrSpend [®] SF pH4 aroma free	1704493	33501	40
Caelo	Aloe vera gel, 10x concentra...	17082002	33511	40
Caelo	Water	172191	33578	40
Caelo	Water	172192	33579	40
Caelo	Water	172220	33580	40
Fagron	SyrSpend [®] SF pH4 aroma free	1704493	33631	40
Caelo	Aloe Vera gel, 1:1	172891	33736	40
Caelo	Water	172533	33741	40
Caelo	Water	172827	33742	40
Caelo	Water	172861	33743	40
Caelo	Water	172862	33744	40
Caelo	Water	172771	33745	40
Caelo	Aloe Vera gel, 1:1	172890	33970	40
Caelo	Water	171147	33977	40
Caelo	Water	172957	33978	40
Retterspitz GmbH	Retterspitz external	017192	34049	40
Caelo	Water	180045	34136	40
Caelo	Water	181105	34137	40
Caelo	Water	181354	34139	40
Caelo	Water	182286	34243	40
Caelo	Water	181952	34244	40
Caelo	Aloe Vera gel, 1:1	181943	34251	40
Caelo	Aloe vera gel, 10x concentra...	181255	34342	40

- 21 568 spectra from a total of 532 batches from further 197 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples 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*.

section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 229 spectra from 74 *Apo-Ident* customers from 92 batches from the substance/substance group *Water and aqueous solutions*.

Supplier	Substance	Batch	Spectra
Caelo	Aloe vera gel, 10x concentra...	15185512	1
WEPA	Water	LOTAP0015	1
wepa	Water	LOTAP0019	1
Fagron	Water	15D13-T07-021465	1
Caelo	Water	15394201	1
Caesar & Loretz/Noweda	Water	15394501	1
Fagron	Water	15L15-T01-028672	1
Fagron	Water	15H25-T14-025670	1
Fagron	Water	15H25-T21-025683	1
Fagron	Water	15H25-T18-025678	1
Phoenix	Water	15L14-T14-028664	1
Fagron	Water	16C23-T06-031423	1
Wepa	Water	LOTAP0031	1
Caelo	Water		1
Caelo	Water	16223801	1
Caelo	Water	14IL38	1
Fagron	Water	15D13-T09-021469	1
Wepa	Water	LOTAP0020	1
Caelo	Water	151005027617	1
Hedinger	Water	219140	1
wepa	Water	LOTAP0034	1
Fagron	Water	16F13-T16-034297	1
Wepa/Wepa	Water	LOTAP0037	1
Caelo	Water	16F13-T18-34301	1
Fagron	Water	16K25-C20-17409	1
Fagron	Water	16F14-T09-034330	1
Euro OTC	Water	16F14-T07-034326	1
Fargon/Kehr	Water	16F13-T18-034301	1
Fagron	Water	15K10-T08-027626	1
Fagron	Water	16L12-T11-039624	1
Phönix EK:8,37 EUR 2L	Water	17B10-T18-041564	1
Fagron	Water	17C31-T05-043064	1
Fagron	Water	16L12-T25-039642	2
GEHE	Water	17114801	1
Caelo	Water	13121720	1
Caelo	Water	17219101	1
Caelo	Water	17277102	1
Caelo	Water	16F13-T11-034264	1
Fagron	Water	17F23-T06-045760	1
Fresenius /Noweda	Water	19KK24GA	1
Fagron	Water	17E05T07044067	1
Gehe	Water	17219101	1
Fagron	Water	17L20-T02-051255	1
Wepa	Water	AP0072	1
wepa	Water	LOTAP0075	1
Caelo	Water	17282701	1
Wepa	Water	LOTAP0072	1
Fagron	Water	17K27-T09-050544	1

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Supplier	Substance	Batch	Spectra
Caelo	Water	18065601	2
Caelo	Water	LOTAP0078	1
Fagron	Water	17E05-T01-044045	1
Fagron	Water	18c13-T14-053737	1
Caelo	Water	18093501	1
Fagron	Water	17K27-T11-050552	1
Caelo	Water	1733981	1
Fagron	Water	18E07-T08-055699	1
Fagron	SyrSpend [®] SF pH4 aroma free	1503D009	1
Fagron	SyrSpend [®] SF pH4 aroma free	1410D020	3
Tiofarma B.V.	SyrSpend [®] SF pH4 aroma free	1410D020	1
Fagron	SyrSpend [®] SF pH4 aroma free	1507402	12
Fagron	SyrSpend [®] SF pH4 aroma free	1605291	6
Caelo	SyrSpend [®] SF pH4 aroma free	1507402	1
Fagron	SyrSpend [®] SF pH4 aroma free	1615584/2	2
Fagron	SyrSpend [®] SF pH4 aroma free	1609686	1
Fagron	SyrSpend [®] SF pH4 aroma free	1704493	8
Fagron	SyrSpend [®] SF pH4 aroma free	161558412	1
Fagron	SyrSpend [®] SF pH4 aroma free	1706769/1	3
Caelo	SyrSpend [®] SF pH4 aroma free	1704493	1
Fagron	SyrSpend [®] SF pH4 aroma free	1712018	4
Fagron	SyrSpend [®] SF pH4 aroma free	27121704	1
Caelo	SyrSpend [®] SF pH4 aroma free	1712023/1	6
Fagron	SyrSpend [®] SF pH4 aroma free	1712023/2	10
Fagron	SyrSpend [®] SF pH4 aroma free	1712023/1	2
Caelo	SyrSpend [®] SF pH4 aroma free	1712023/2	1
Fagron	SyrSpend [®] SF pH4 aroma free	1802653/4	1
Fagron	SyrSpend [®] SF pH4 cherry aroma	1503D017	1
Apomix/ Sanacorp	SyrSpend [®] SF pH4 cherry aroma	15C19/C	1
Fagron	SyrSpend [®] SF pH4 cherry aroma	1503255	17
Fagron	SyrSpend [®] SF pH4 cherry aroma	15C19/C	1
Caelo	SyrSpend [®] SF pH4 cherry aroma	1507318	3
Fagron	SyrSpend [®] SF pH4 cherry aroma	1507318	4
Fagron	SyrSpend [®] SF pH4 cherry aroma	1603252/2	10
Fagron	SyrSpend [®] SF pH4 cherry aroma	1612631	17
Fagron	SyrSpend [®] SF pH4 cherry aroma	1701543/3	4
Fagron	SyrSpend [®] SF pH4 cherry aroma	1702015	10
Fagron	SyrSpend [®] SF pH4 cherry aroma	1707302/1	7
Caelo	SyrSpend [®] SF pH4 cherry aroma	1702015	2
Fragron	SyrSpend [®] SF pH4 cherry aroma	1702015	1
Fagron	SyrSpend [®] SF pH4 cherry aroma	1702015 (2Flaschen)	1
Fagron	SyrSpend [®] SF pH4 cherry aroma	1704492/1	1
Fagron	SyrSpend [®] SF pH4 cherry aroma	1712024	6
Fagron	SyrSpend [®] SF pH4 cherry aroma	2x1712024	1
Fagron	SyrSpend [®] SF pH4 cherry aroma	720023-0003	1
Fagron	SyrSpend [®] SF pH4 cherry aroma	1800673/1	4
Fagron	SyrSpend [®] SF pH4 cherry aroma	1800673	1
Fagron	SyrSpend [®] SF pH4 cherry aroma	18000673/1	1
Fagron	SyrSpend [®] SF pH4 cherry aroma	1800673/2	1
Fagron	SyrSpend [®] SF pH4 cherry aroma	1803724/2	5
Gehe	SyrSpend [®] SF pH4 cherry aroma	1803724/2	1
Fagron	SyrSpend [®] SF pH4 cherry aroma	1806233/1	2
Fagron	SyrSpend [®] SF pH4 cherry aroma	1806233/2	1
Retterspitz/ Phoenix	Retterspitz external	17224	1
Retterspitz/ Phoenix	Retterspitz external	18045	1

- 3983 spectra from 389 *Apo-Ident* customers from a total of 2019 batches from a further 130 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	830	0	19 848
Type B	0	1779	1	21 428
Type C	0	226	3	3971

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9552 %)	100.0000 % (> 99.2771 %)
Type B	100.0000 % (> 99.9516 %)	99.9438 % (> 99.7753 %)
Type C	100.0000 % (> 98.5527 %)	98.6900 % (> 97.3799 %)

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

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

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

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
31623	31623	0.00	30.59
31675	31675	0.00	33.85
32079	32079	0.00	31.95
33430	33430	0.00	25.60
33431	33431	0.00	25.82
31145	31145	0.00	32.07
31866	31866	0.00	31.85
31880	31880	0.00	33.56
32785	32785	0.00	19.16
31881	31881	0.00	31.38

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Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
31146	31146	0.00	28.70
31862	31862	0.00	28.24
32313	32313	0.00	27.35
31670	31670	0.00	29.92
31722	31722	0.00	28.67
31671	31671	0.00	30.91
31723	31723	0.00	28.97
31047	31047	0.00	27.24
33787	33787	0.00	27.97
31857	31857	0.00	26.41
33612	33612	0.00	26.54

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Wax ointment (stabilised)**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 31111-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Wax ointment (stabilised); Unguentum cereum

Special notes

When selecting the *Wax ointment (stabilised)* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Wax ointment (stabilised)*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Wax ointment (st...	13072102	31111	40	not required
Caelo	Wax ointment (st...	13307701	31167	40	not required
Caelo	Wax ointment (st...	14073701	31444	40	not required
Caelo	Wax ointment (st...	154243	31911	40	20151217*
Caelo	Wax ointment (st...	154244	31912	40	20151217*

Validation samples

A total of 48 238 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 *Wax ointment (stabilised)*. These samples are listed above in the [calibration samples](#) section.
- 20 478 spectra from a total of 481 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 240 spectra of 7 reference samples from the substance/substance group *Wax ointment (stabilised)*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Wax ointment (stabilised)	12352501	30967	40
Caelo	Wax ointment (stabilised)	154243	31911 [†]	20
Caelo	Wax ointment (stabilised)	154244	31912 [†]	20
Caelo	Wax ointment (stabilised)	161215	32117	40
Caelo	Wax ointment (stabilised)	161334	32118	40
Caelo	Wax ointment (stabilised)	171714	33550	40
Caelo	Wax ointment (stabilised)	172942	34024	40

- 23 108 spectra from a total of 571 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information

*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*.

provided by the customer regarding manufacturer and batch number.

- 249 spectra from 104 *Apo-Ident* customers from 52 batches from the substance/substance group *Wax ointment (stabilised)*.

Supplier	Substance	Batch	Spectra
Caelo	Wax ointment (stabilised)	11355202	1
Caelo	Wax ointment (stabilised)	12033602	2
Caelo	Wax ointment (stabilised)	7071204	1
Caelo	Wax ointment (stabilised)	12033701	4
Caelo	Wax ointment (stabilised)	12209401	3
Caelo	Wax ointment (stabilised)	12209402	1
Anzag 07.12.12	Wax ointment (stabilised)	12128702	1
Caelo	Wax ointment (stabilised)	20051012-1	1
Caelo	Wax ointment (stabilised)	1218702	2
Caelo	Wax ointment (stabilised)	1021303	1
Sanacorp	Wax ointment (stabilised)	12352501	1
Caelo	Wax ointment (stabilised)	12352501	4
Caelo	Wax ointment (stabilised)	12378701	5
Caesar & Loretz GmbH	Wax ointment (stabilised)	13072102	1
Caelo	Wax ointment (stabilised)	13072102	11
Caelo	Wax ointment (stabilised)	U-150513-2	1
Caelo	Wax ointment (stabilised)	11355201	2
Caelo	Wax ointment (stabilised)	12352051	1
Caelo	Wax ointment (stabilised)	13159303	2
Gehe	Wax ointment (stabilised)	13072102	1
Caelo	Wax ointment (stabilised)	13159302	6
Caelo	Wax ointment (stabilised)	11321302	1
Caelo	Wax ointment (stabilised)	13307701	16
Caelo	Wax ointment (stabilised)	20121305	1
Caelo	Wax ointment (stabilised)	13307802	11
Caelo	Wax ointment (stabilised)	1114E3212	1
Caelo	Wax ointment (stabilised)	14073701	13
Caelo	Wax ointment (stabilised)	14073801	6
Sanacorp	Wax ointment (stabilised)	14073701	1
AHD	Wax ointment (stabilised)	14073701	1
Caelo	Wax ointment (stabilised)	140737701	1
Caelo	Wax ointment (stabilised)	2113Q-03212	1
Caelo	Wax ointment (stabilised)	1407301	1
Caelo	Wax ointment (stabilised)	14235901	12
Caelo	Wax ointment (stabilised)	140737012	1
VDL;6,45EUR;21.10.14	Wax ointment (stabilised)	14235901	1
Caelo	Wax ointment (stabilised)	14072801	1
Caelo	Wax ointment (stabilised)	15025801	16
Caelo	Wax ointment (stabilised)	14236001	2
Caelo	Wax ointment (stabilised)	28051511	1
Caelo	Wax ointment (stabilised)	14236002	2
Caelo	Wax ointment (stabilised)	15025702	9
Sanacorp	Wax ointment (stabilised)	15205402	2
Caelo	Wax ointment (stabilised)	15205402	12
Caelo	Wax ointment (stabilised)	15424301	13
Caelo	Wax ointment (stabilised)	15424402	2
Henry Lamotte Olis GmbH...	Wax ointment (stabilised)	15424301	1
Celo	Wax ointment (stabilised)	15424402	1
Caelo	Wax ointment (stabilised)	1524301	1
Caelo	Wax ointment (stabilised)	15424401	6
Caeol/Phoenix	Wax ointment (stabilised)	15424301	1
Caelo	Wax ointment (stabilised)	16121502	4
Caelo	Wax ointment (stabilised)	16133401	14
Caelo	Wax ointment (stabilised)	1524401	1

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Supplier	Substance	Batch	Spectra
Caelo	Wax ointment (stabilised)	16121501	4
Caelo	Wax ointment (stabilised)	17014901	4
Gehe	Wax ointment (stabilised)	16133401	1
Caelo	Wax ointment (stabilised)	17015001	9
Caelo	Wax ointment (stabilised)	17015002	1
Sanacorp	Wax ointment (stabilised)	17015001	1
Caelo	Wax ointment (stabilised)	17171401	5
Caesar und Loretz GmbH	Wax ointment (stabilised)	17015001	1
Noweda	Wax ointment (stabilised)	17171401	1
GEHE	Wax ointment (stabilised)	17171401	1
Sanacoro W.E:06.03.18 ...	Wax ointment (stabilised)	17171401	1
Caelo	Wax ointment (stabilised)	17294201	7
Cealo/Sanacorp	Wax ointment (stabilised)	18034602	1
Caelo	Wax ointment (stabilised)	18034602	2
Caelo	Wax ointment (stabilised)	18162201	1

- 3963 spectra from 385 *Apo-Ident* customers from a total of 2059 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Wax ointment (stabilised)* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Wax ointment (stabilised)* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 478
Type B	0	240	0	23 108
Type C	0	247	2	3963

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9554 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9507 %)	100.0000 % (> 97.5000 %)
Type C	100.0000 % (> 98.5347 %)	99.1968 % (> 97.9920 %)

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

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

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

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
31911	31911	0.00	34.95
31912	31912	0.00	42.20
31111	31111	0.00	38.34
31167	31167	0.00	39.77
31444	31444	0.00	39.07

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **White paraffin oil**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 32342-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

White paraffin oil; Oleum Vaselini album

Special notes

When selecting the *White paraffin oil* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *White paraffin oil*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	White paraffin oil	162192	32342	40	20160729*
Caelo	White paraffin oil	15380806	32565	40	not required

Validation samples

A total of 48 238 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 *White paraffin oil*. These samples are listed above in the [calibration samples](#) section.
- 20 598 spectra from a total of 484 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 80 spectra of 2 reference samples from the substance/substance group *White paraffin oil*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	White paraffin oil	14338604	32454	40
Caelo	White paraffin oil	14338604	32846	40

- 23 268 spectra from a total of 577 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 1 spectra from 1 *Apo-Ident* customers from 1 batches from the substance/substance group *White paraffin oil*.

Supplier	Substance	Batch	Spectra
Cealo / Spangro	White paraffin oil	16219204	1

*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.

- 4211 spectra from 396 *Apo-Ident* customers from a total of 2110 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *White paraffin oil* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *White paraffin oil* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 598
Type B	0	80	0	23 268
Type C	0	1	0	4211

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9558 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9510 %)	100.0000 % (> 92.5000 %)
Type C	100.0000 % (> 98.6061 %)	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
32342	32342	0.00	24.96
32565	32565	0.00	25.76

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Wintergreen oil**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 30455-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Wintergreen oil; Oleum gaultheria procumbens

Special notes

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

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Wintergreen oil*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Taoasis	Wintergreen oil	5411006-117696	31543	40	not required
Taoasis	Wintergreen oil	1828-125286	32807	40	not required

Validation samples

A total of 48 238 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 *Wintergreen oil*. These samples are listed above in the [calibration samples](#) section.
- 20 598 spectra from a total of 484 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 176 spectra of 5 reference samples from the substance/substance group *Wintergreen oil*.

Supplier	Substance	Batch	Sample ID	Spectra
Taoasis	Wintergreen oil	5411006-117696	31543 [†]	16
Taoasis	Wintergreen oil	1828-125286	32936	40
Taoasis	Wintergreen oil	1953-128607	33624	40
Taoasis	Wintergreen oil	1953-128607	33625	40
Primavera	Wintergreen oil	00129A27	34399	40

- 23 172 spectra from a total of 574 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 9 spectra from 8 *Apo-Ident* customers from 9 batches from the substance/substance group *Wintergreen oil*.

[†]These spectra were recorded from 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
Taoasis	Wintergreen oil	423121-90971	1
Caelo	Wintergreen oil	10318703	1
Caelo	Wintergreen oil	10318714	1
Taoasis	Wintergreen oil	97540	1
Caelo	Wintergreen oil	13099202	1
Caelo	Wintergreen oil	13099205	1
Caelo	Wintergreen oil	15087406	1
Taoasis	Wintergreen oil	1303-121125	1
Taoasis	Wintergreen oil		1

- 4203 spectra from 396 *Apo-Ident* customers from a total of 2102 batches from a further 134 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Wintergreen oil* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Wintergreen oil* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 598
Type B	0	174	2	23 172
Type C	0	7	2	4203

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9558 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9508 %)	98.8636 % (> 97.1591 %)
Type C	100.0000 % (> 98.5424 %)	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
31543	31543	0.00	298.79
32807	32807	0.00	300.43

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Yarrow oil**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 33795-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Yarrow oil

Special notes

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

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Yarrow oil*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Primavera	Yarrow oil	00516E25	33795	40	not required
Taoasis	Yarrow oil	2041-316	33822	40	not required

Validation samples

A total of 48 238 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 *Yarrow oil*. These samples are listed above in the [calibration samples](#) section.
- 20 598 spectra from a total of 484 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 120 spectra of 3 reference samples from the substance/substance group *Yarrow oil*.

Supplier	Substance	Batch	Sample ID	Spectra
Taoasis	Yarrow oil	128700	33823	40
Primavera	Yarrow oil	00677E26	34174	40
Primavera	Yarrow oil	00197J26	34295	40

- 23 228 spectra from a total of 575 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 0 spectra from 0 *Apo-Ident* customers from 0 batches from the substance/substance group *Yarrow oil*.
- 4212 spectra from 396 *Apo-Ident* customers from a total of 2111 batches from a further 135 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Yarrow oil* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Yarrow oil* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 598
Type B	0	107	13	23 228
Type C	0	0	0	4212

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9558 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9508 %)	89.1667 % (> 86.6667 %)
Type C	100.0000 % (> 98.5344 %)	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
33822	33822	0.00	20.65
33795	33795	0.00	51.16

VALIDATION REPORT

IdentModul 2.0-2019-02

Validated substance/substance group **Ylang-ylang oil**
Substance class APIs & excipients, liquid/semi-solid (other)
Report date 24/05/2019
Report number 31506-2019-05-24
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Ylang-ylang oil; Oleum ylang-ylang

Special notes

When selecting the *Ylang-ylang oil* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-6679-5 *European Pharmacopoeia 9th Edition, Basic Version 2017* [3]
Komm2.2.40 *Erfüllung von Ph. Eur. 2.2.40 durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*
Appendix F [Addition to the second-stage models](#)

Validation method

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

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Ylang-ylang oil*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Taoasis	Ylang-ylang oil	140114-115612	31506	40	not required
Taoasis	Ylang-ylang oil	07122-119828	31653	40	not required
Taoasis	Ylang-ylang oil	41813-124965	32808	40	not required
Primavera	Ylang-ylang oil	00403M26	34382	40	not required

Validation samples

A total of 48 238 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 *Ylang-ylang oil*. These samples are listed above in the [calibration samples](#) section.
- 20 518 spectra from a total of 482 batches from further 158 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 120 spectra of 4 reference samples from the substance/substance group *Ylang-ylang oil*.

Supplier	Substance	Batch	Sample ID	Spectra
Taoasis	Ylang-ylang oil	140114-115612	31506 [†]	20
Taoasis	Ylang-ylang oil	07122-119828	31653 [†]	20
Taoasis	Ylang-ylang oil	43197-126348	33049	40
Taoasis	Ylang-ylang oil	B966015-128199	33648	40

- 23 228 spectra from a total of 574 batches from further 203 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in 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 of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 0 spectra from 0 *Apo-Ident* customers from 0 batches from the substance/substance group *Ylang-ylang oil*.

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

- 4212 spectra from 396 *Apo-Ident* customers from a total of 2111 batches from a further 135 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Ylang-ylang oil* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ylang-ylang oil* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 518
Type B	0	74	46	23 228
Type C	0	0	0	4212

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9555 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9508 %)	61.6667 % (> 59.1667 %)
Type C	100.0000 % (> 98.5344 %)	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
34382	34382	0.00	77.27
32808	32808	0.00	82.25
31653	31653	0.00	39.36
31506	31506	0.00	93.47

Appendix A: Additional calibration samples (Type A)

Not required.

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 79 batches. From these 3410 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
Actavis	Abitima [®] clinic ...	159997	40	not required
Actavis	Abitima [®] clinic ...	159997	40	not required
Actavis	Abitima [®] clinic ...	145054	40	not required
Allergika	Dermifant [®] kids ...	1705081	40	not required
Allergika	Dermifant [®] kids ...	1306020	40	not required
Allergika	Dermifant [®] kids ...	1301020	80	not required
Allergika	Dermifant [®] kids ...	1607080	40	not required
Bayer	Ultrasicc [®]	33851A	40	not required
Bayer	Ultrapril [®]	22100A	40	not required
Bayer	Ultrasicc [®]	33614A	40	not required
Bene	Thrombocid [®] gel	401B101	40	not required
Bene	Thrombocid [®] gel	403I143	40	not required
Bene	Thrombocid [®] gel	401B101	40	not required
Bene	Thrombocid [®] gel	403I143	40	not required
Bene	Thrombocid [®] gel	403I143	40	not required
Bene	Thrombocid [®] oint...	409A151	40	not required
Bene	Thrombocid [®] oint...	410B113	40	not required
Bene	Thrombocid [®] oint...	410B113	40	not required
Bene	Thrombocid [®] oint...	408C141	40	not required
Caelo	Milking grease S...	162049	40	20160711*
Caelo	Pine oil rubbing...	162091	40	20160713*
Caelo	Ultrasound conta...	12031301	40	not required
Caelo	Vario base cream	13257102	40	1405330
Caelo	Vario base cream	12077902	50	1405329
Dr. Wolff	Anefug [®] Simplex	234280	40	not required
Dr. Wolff	Anefug [®] Simplex	237590	40	1407216
Dr. Wolff	Linola [®] acute 0.5%	334620	40	not required
Dr. Wolff	Linola [®] sun prot...	134530	40	not required
Einhorn-Apoth...	Rizol raw material	AL0413-1	60	not required
Fagron	Fitalite TM	1503259	40	not required
Fagron	Fitalite TM	14B18-T01-010352	60	not required
Fagron	Fitalite TM	1503259	40	not required
Fagron	Fitalite TM	14B18-T01-010352	60	not required
Fagron	Fitalite TM	1503259	40	not required
Fagron	Ora-Plus [®]	3334081	60	not required
Fagron	Ora-Sweet [®]	3062252	40	not required
Fagron	Versatile TM	1503256	40	not required
Fagron	Versatile TM	1503256	40	not required
Fagron	Versatile TM	14B19-T02-010391	60	not required
Fagron	Versatile TM	14B19-T02-010391	60	not required
Fagron	Versatile TM	1503256	40	not required
Fagron	Versatile TM Rich	1503257	40	not required
Fagron	Versatile TM Rich	1503257	40	not required
Fagron	Versatile TM Rich	1503257	40	not required
Fagron	Versatile TM Rich	14B19-T08-010395	60	not required
Fagron	Versatile TM Rich	14B19-T04-010395	60	not required
Koko	dermaviduals [®] ba...	L003L13	60	not required

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Supplier	Substance	Batch	Spectra	Certificate
Paddock	Ora-Blend [®]	2280130	40	not required
Perrigo	Ora-Blend [®] SF	3112578	40	not required
Perrigo	Ora-Plus [®]	3334081	40	not required
Perrigo	Ora-Sweet [®]	3062252	40	not required
Pharmapol	Glycerol trinitr...	232961	60	not required
Pharmapol	Glycerol trinitr...	228718	40	not required
Primavera	Anise seed oil	00480L26	40	not required
Primavera	Cardamom (essent...	00897G25	40	not required
Primavera	Cardamom (essent...	00080M25	40	not required
Primavera	Douglas fir oil	00539M26	40	not required
Primavera	Ho-leaf oil	00388M26	40	not required
Primavera	Jasmine 4% in al...	00184A27	40	not required
Primavera	Lavandin oil	00508L26	40	not required
Primavera	Lemon verbena oil	00540M26	40	not required
Primavera	Litsea oil	00496L26	40	not required
Primavera	Rose oil 10%	00721716	40	not required
Primavera	Rose, pure (esse...	00099L26	40	not required
Primavera	Seabuckthorn oil...	00346E26	40	not required
Primavera	Spanish sage oil	00057G26	40	not required
Primavera	Tolu Resinoid	00115A25	40	not required
Salderman Gmb...	Salderman base e...	180123	40	not required
Spirig Pharma	Kerasal [®] base oi...	N011	40	not required
Spirig Pharma	Kerasal [®] base oi...	M031	40	not required
Stiefel	Physiogel [®] hypoa...	6940	40	not required
Stiefel	Physiogel [®] hypoa...	343P	40	not required
Stoko	Praecutan [®] lotio...	011657101571	40	not required
Stoko	Praecutan [®] lotio...	0915777806	40	not required
Taoasis	Black cumin oil	504511-115611	40	not required
Taoasis	Rose, pure (esse...	12014-120330H08	40	not required
Taoasis	Tolu res. 50% oil	493887-105383BAC90451	40	not required
Taoasis	Tonka extract	3636K08	40	not required
Taoasis	Vanilla extract ...	789171-114788	40	not required

*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 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 82 batches. From these, 140 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
Allergika/Kehr	Dermifant [®] kids lotion	1604060	1
Anzag	Capsaicin liquid extr...	120503801	1
Anzag/Galderma	Kerasal [®] base ointment	S075	1
Arkeo Immun UG	Rizol raw material	1192HJ	2
Bombastus	Vario base cream	12375801	1
Caelo	Milk Cordes [®] O/W Emul...	13D001	2
Caelo	Rizol raw material	15144304	1
Caelo	Vario base cream	13257102	2
Caelo	Vario base cream	14331902	4
Caelo	Vario base cream	16032402	1
Caelo	Vario base cream	13143401	1
Caelo	Vario base cream	12077902	1
Dr. Wolff	Anefug [®] Simplex	136840	1
Dyckerhoff	Regeneresen	60611dü-2	1
Dyckerhoff	Regeneresen	150173th-2	1
Dyckerhoff	Regeneresen	1202920v-2	1
Dyckerhoff	Regeneresen	120323Lu-2	1
Dyckerhoff	Regeneresen	120313Kn-2	1
Dyckerhoff	Regeneresen	1503839-Na	1
Dyckerhoff	Regeneresen	120333NN-2	1
Dyckerhoff	Regeneresen	120053NNR-2	1
Euro OTC	Capsaicin liquid extr...	6061204	1
Euro OTC	Capsaicin liquid extr...	12111205	1
Euro OTC	Capsaicin liquid extr...	1205038-01	2
Euro OTC	Capsaicin liquid extr...	1201010-01	1
EUro/AHD	Capsaicin liquid extr...	1205038-02	1
Fagron	Fitalite TM	1503259	2
Fagron	Ora-Blend [®] SF	3745164	1
Fagron	Ora-Blend [®] SF	4136370	1
Fagron	Ora-Sweet [®]	4247427	2
Fagron	Ora-Sweet [®]	3414679	1
Fagron	Versatile TM	14B19-T02-010391	2
Fagron	Versatile TM Rich	1503257	4
Fagron	Versatile TM Rich	247224-0002	1
Fagron	Versatile TM Rich	14B19-T04-0130395	1
Galderma/Gehe	Kerasal [®] base ointment	S061	1
Galderma/Anzag	Kerasal [®] base ointment	S041	4
Gehe	Glycerol trinitrate 5%	214895	1
Gehe	Glycerol trinitrate 5%	221414	3
Gehe	Ora-Blend [®] SF	3112578	1
Gehe	Ora-Blend [®] SF	2038178	1
GSK Stiefel	Physiogel [®] hypoallerg...	859R	1
GSK/Stiefel	Physiogel [®] hypoallerg...	538T	1
Ichthyol	Milk Cordes [®] O/W Emul...	60613	1
Ichthyol - Gesellschaft	Milk Cordes [®] O/W Emul...	11D037	1
Ichthyol / Noweda	Milk Cordes [®] O/W Emul...	12D008	5

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Supplier	Substance	Batch	Spectra
IchthyolGmbH/Anzag	Milk Cordes [®] O/W Emul...	12D003	2
Ichtyol, Noweda	Milk Cordes [®] O/W Emul...	13d007	1
Perrigo	Ora-Blend [®] SF	2088609	1
Pharmapohl	Glycerol trinitrate 5%	18102013A	1
Pharmapol	Glycerol trinitrate 5%	232961	3
Pharmapol	Glycerol trinitrate 5%	228718	11
Pharmapol	Glycerol trinitrate 5%	AKD81	1
Pharmapol	Glycerol trinitrate 5%	219108	4
Pharmapol	Glycerol trinitrate 5%	224310	5
Pharmapol	Glycerol trinitrate 5%	224310(ex)224658(in)	1
Pharmapol	Glycerol trinitrate 5%	226578	9
Pharmapol	Glycerol trinitrate 5%	234783	2
Pharmapol	Glycerol trinitrate 5%	25041301	1
Pharmapol Arzneimittel...	Glycerol trinitrate 5%	232961	6
Pharmapol/Zentrum Apo	Glycerol trinitrate 5%	2913A-07002	1
PHOENIX 21.10.2013	Physiogel [®] hypoallerg...	1142N	1
Phoenix/Stiefel	Physiogel [®] hypoallerg...	399P	1
Phönix	Ora-Blend [®] SF	3475164	1
Phönix	Ora-Blend [®] SF	3434856	2
Sanacorp EK:10,80 ...	Dermifant [®] kids lotion	1705111	1
Spirig Pharma	Kerasal [®] base ointment	N021	1
Spirig/Gehe	Kerasal [®] base ointment	S076	1
Spirig/Sanacorp	Kerasal [®] base ointment	N011	1
Steidl/Phytolab	Rizol raw material	200812174102290	1
Stiefel	Physiogel [®] hypoallerg...	537T	1
Stiefel	Physiogel [®] hypoallerg...	270T	1
Stiefel	Physiogel [®] hypoallerg...	926Q	1
Stiefel/Noweda	Physiogel [®] hypoallerg...	163R	1
Stiefel/Sanacorp	Physiogel [®] hypoallerg...	10000	1
Taoasis	Tolu res. 50% oil	23772-119167	1
Taoasis	Tolu res. 50% oil	23772-118646	1
Taoasis	Tolu res. 50% oil	546022-122636	1
Taoasis	Tolu res. 50% oil	546022-114802	2
Taoasis	Tolu res. 50% oil	493887-105384	1
Taoasis	Wild rose oil	106177-106175	1
Taoasis	Wild rose oil	99149-99474	1

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).

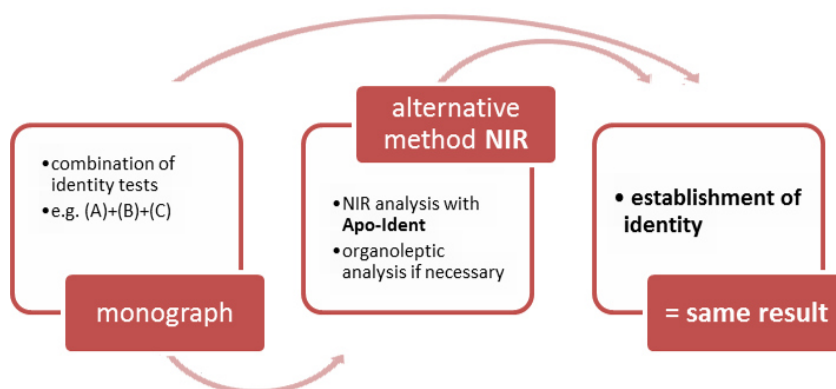


Figure 2: The combination of tests of the monograph is replaced by the alternative method NIR spectroscopy using *Apo-Ident*. This is permissible because both test procedures result in the establishment of the identity of the raw material.

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].

Appendix F: Addition to the second-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 second-stage models

In the *Apo-Ident Update 2019-02*, a distinction is made between the following substances in the listed second-stage models:

Submodel 1

Bacitracin
Betamethasone, micronized
Betamethasone valerate
Budesonide, micronized
Capsaicin
Dexamethasone
Erythromycin
Heparin sodium
Hydrocortisone butyrate
Norethisterone acetate
Prednicarbate, micronized
Prednisolone, micronized
Prednisone
Triamcinolone, 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 alcohols cream DAB/SR

References

- [1] ABDA – BUNDESVEREINIGUNG DEUTSCHER APOTHEKERVERBÄNDE: Verordnung über den Betrieb von Apotheken (Apothekenbetriebsordnung – ApBetrO), 2012
- [2] REIMANN, B. ; REGIERUNGSPRÄSIDIUM DARMSTADT: Hinweise zur ordnungsgemäßen Prüfung von Arzneimitteln und Ausgangsstoffen (§§ 6 und 11 *ApBetrO*), 2007
- [3] *Europäisches Arzneibuch, Grundwerk 2017*. 9. Ausgabe. Deutscher Apotheker Verlag (978-3-7692-6679-5)
- [4] HIPERSCAN GMBH: Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident, 2013
- [5] ARBEITSGEMEINSCHAFT DER PHARMAZIERÄTE DEUTSCHLANDS (APD): Resolution in Verbindung mit §§ 6 und 11 *ApBetrO* Verwendung eines Nah-Infrarot-Spektrometers (NIR) zur Identitätsprüfung, 16. 10. 2013, DAZ 48, November 2013
- [6] ARBEITSGEMEINSCHAFT DER PHARMAZIERÄTE DEUTSCHLANDS (APD): Resolution 2014, Arbeitsgemeinschaft der Pharmazieräte Deutschlands (APD), Oktober 2014
- [7] *DAC/NRF*. Govi-Verlag (978-3-7741-0044-2)
- [8] KESSLER, W.: *Multivariate Datenanalyse*. WILEY-VCH Verlag, 2007 (978-3-527-31262-7)
- [9] NÆS, T. ; ISAKSSON, T. ; FEARN, T. ; DAVIES, T.: *Multivariate Calibration and Classification*. NIR Publications, 2002 (978 0 9528666 2 6)
- [10] HANLEY, J. A. ; LIPPMAN-HAND, A.: If nothing goes wrong, is everything all right? In: *Journal of the American Medical Association* 249 (1983), S. 1743–1745
- [11] JOVANOVIĆ, B. D. ; LEVY, P. S.: A Look at the Rule of Three. In: *The American Statistician* 51 (1997), S. 137–139
- [12] BRONSTEIN, I. N. ; SEMENDJAJEW, K. A. ; MUSIOL, G. ; MÜHLIG, H.: *Taschenbuch der Mathematik*. 5. überarbeitete und erweiterte Auflage. Verlag Harri Deutsch, 2000 (3-8171-2015-2)
- [13] MAHALANOBIS, P.: On the generalized distance in statistics. In: *Proc. Nat. Inst. Sci. India (Calcutta)* 2 (1936), S. 49–55
- [14] YAMBOR, B. ; DRAPER, W. ; BEVERIDGE, R.: Analyzing PCA-based face recognition algorithms: Eigenvector selection and distance measures. In: *Second Workshop Empirical Evaluation in Computer Vision* (2000)
- [15] HIPERSCAN GMBH: Identifikationsmethodik Apo-Ident, 2012
- [16] HIPERSCAN GMBH: Datenvorbehandlung des Identifikationssystems Apo-Ident, 2012
- [17] CYRAN ; RÖTTA: Apothekenbetriebsordnung, Kommentar § 6 Rn. 10, 2010

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- Abitima® clinic face cream, *see* [Hydrophilic ointments](#)
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